US006966709B2

(12) **United States Patent**
Takanashi

(10) **Patent No.: US 6,966,709 B2**
(45) **Date of Patent: Nov. 22, 2005**

(54) **CAMERA EXTERIOR PART AND CAMERA WITH LENS BARRIER**

(75) Inventor: **Tatsuo Takanashi**, Tokyo (JP)

(73) Assignee: **Olympus Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/995,807**

(22) Filed: **Nov. 23, 2004**

(65) **Prior Publication Data**

US 2005/0074234 A1 Apr. 7, 2005

Related U.S. Application Data

(62) Division of application No. 10/408,594, filed on Apr. 7, 2003, now Pat. No. 6,826,367.

(30) **Foreign Application Priority Data**

Apr. 9, 2002 (JP) 2002-106888
Apr. 9, 2002 (JP) 2002-106900
Apr. 22, 2002 (JP) 2002-119307
Jun. 10, 2002 (JP) 2002-169004

(51) **Int. Cl.**[7] **G03B 17/00**; G03B 17/02
(52) **U.S. Cl.** **396/448**; 396/536
(58) **Field of Search** 396/448, 535, 396/536

(56) **References Cited**

U.S. PATENT DOCUMENTS

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6,450,708 B1 * 9/2002 Takanashi 396/448

* cited by examiner

Primary Examiner—Christopher Mahoney
(74) *Attorney, Agent, or Firm*—Volpe and Koenig, P.C.

(57) **ABSTRACT**

A camera having a lens barrier movable between an open and a closed position, a lens movable between a photographing position and a non-photographing position and a locking member which, when driven by movement of the lens barrel to the photography position, enters into an opening in the barrier if an attempt is made to move the barrier from the open position towards the closed position. A pressing spring returns the locking member to the withdrawn position when the lens barrel is moved to the non-photographing position. An elastic pressing plate is preferably used to drive the locking member to the projected position against the force of the pressing spring when the lens is moved towards the photographing position.

17 Claims, 25 Drawing Sheets

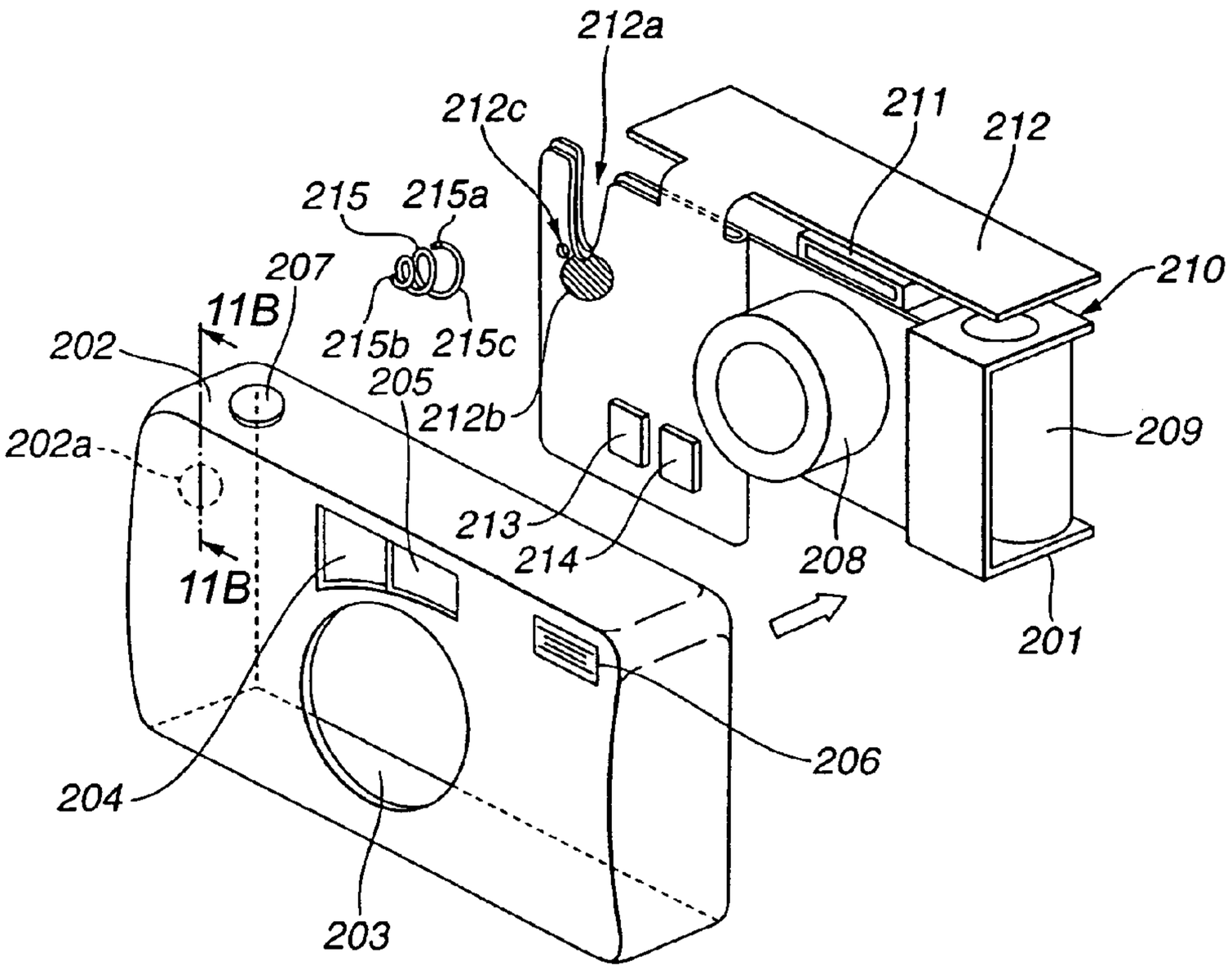
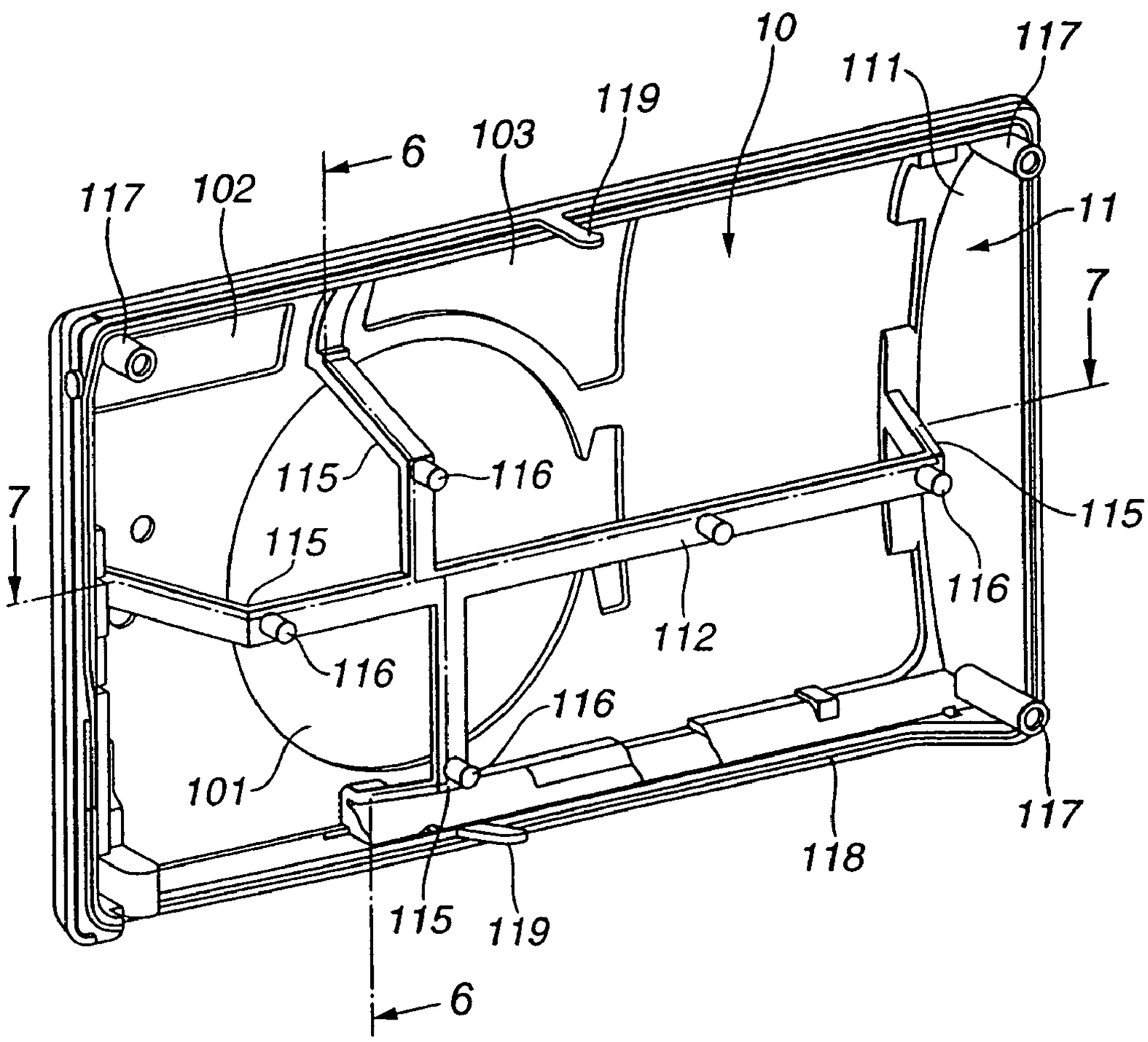


FIG.1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117
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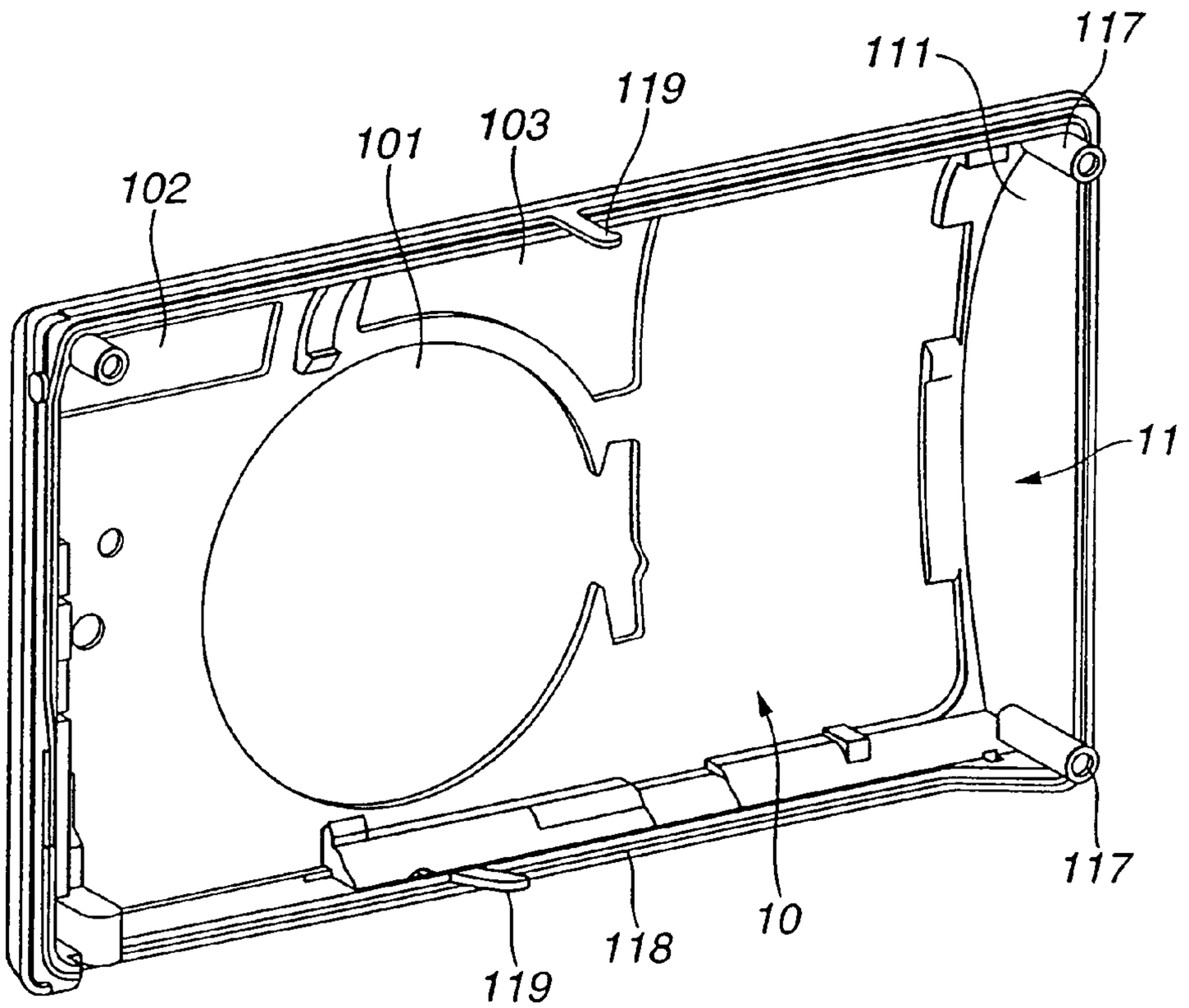
FIG.2



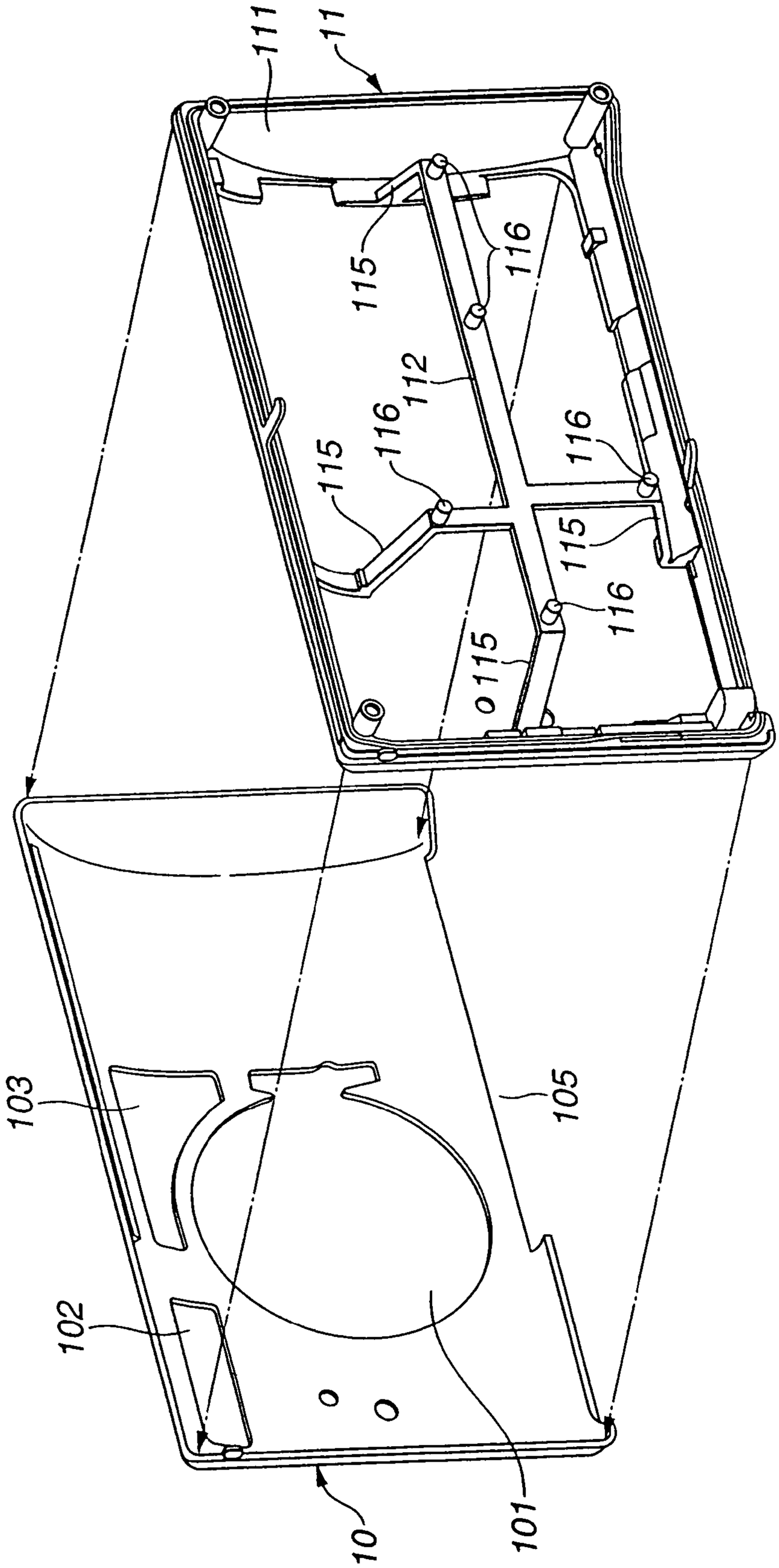


FIG.3

FIG.4

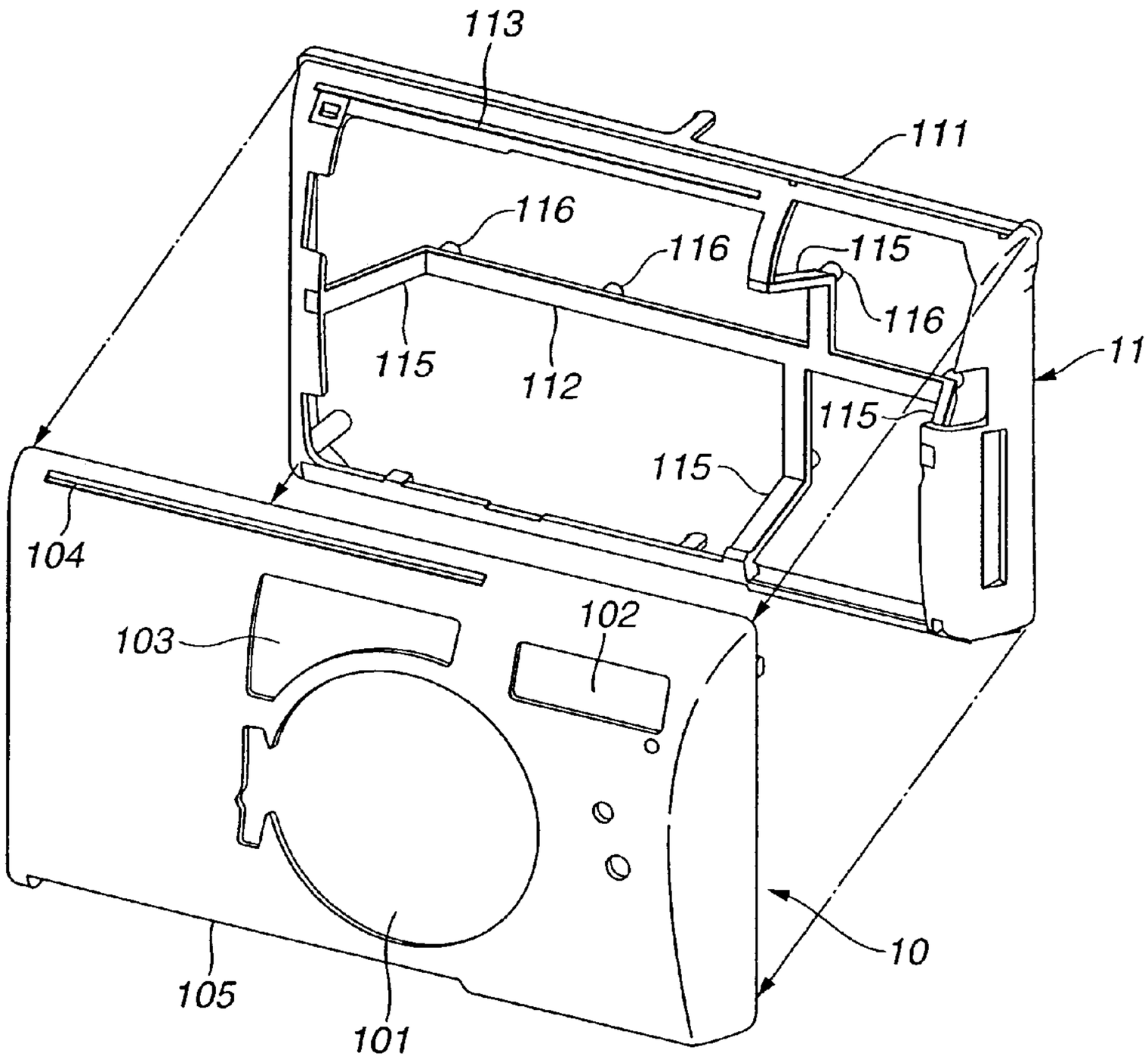
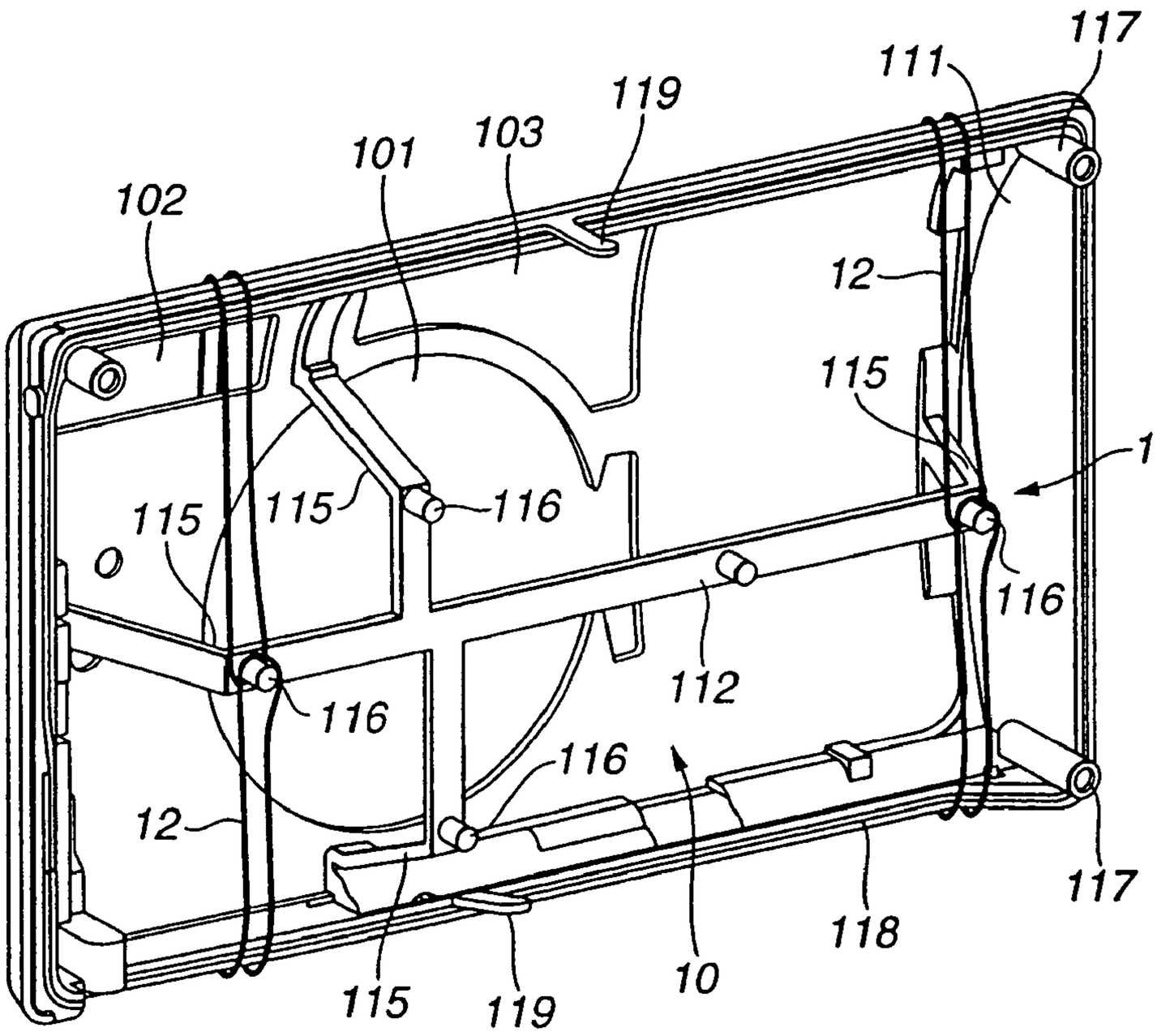


FIG.5


117
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119
10

FIG.6

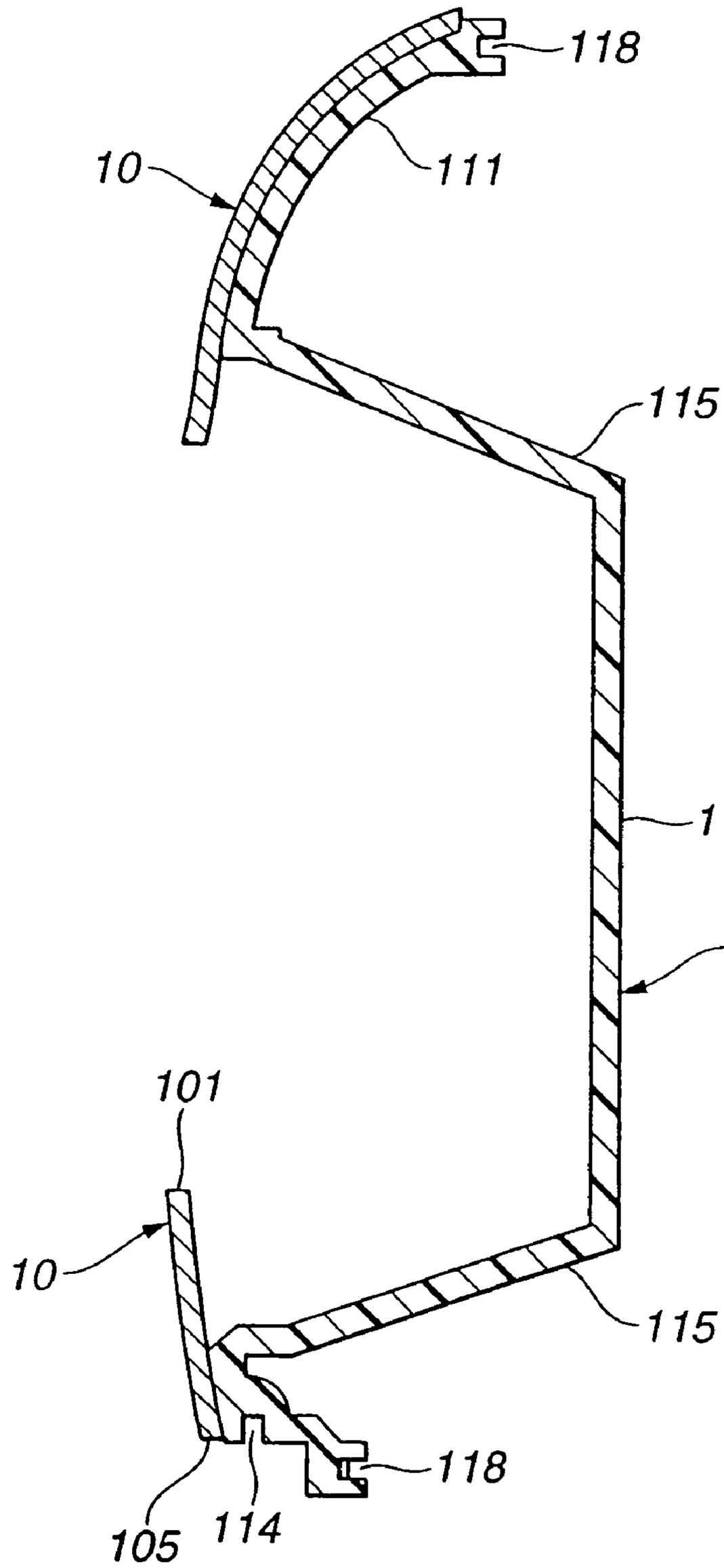


FIG.7

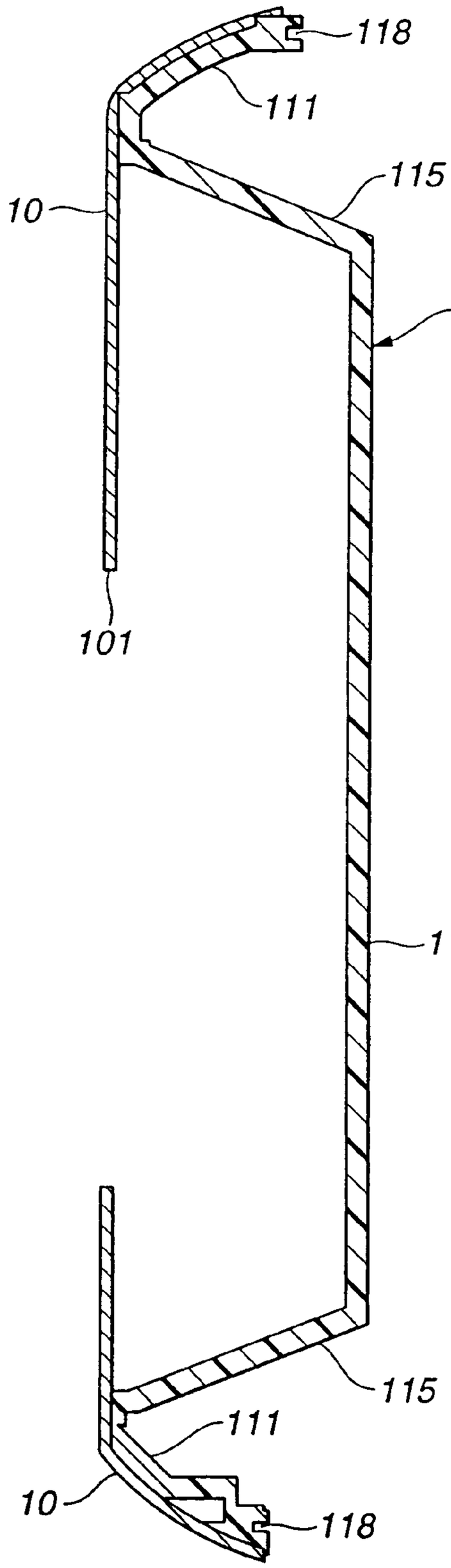


FIG.8

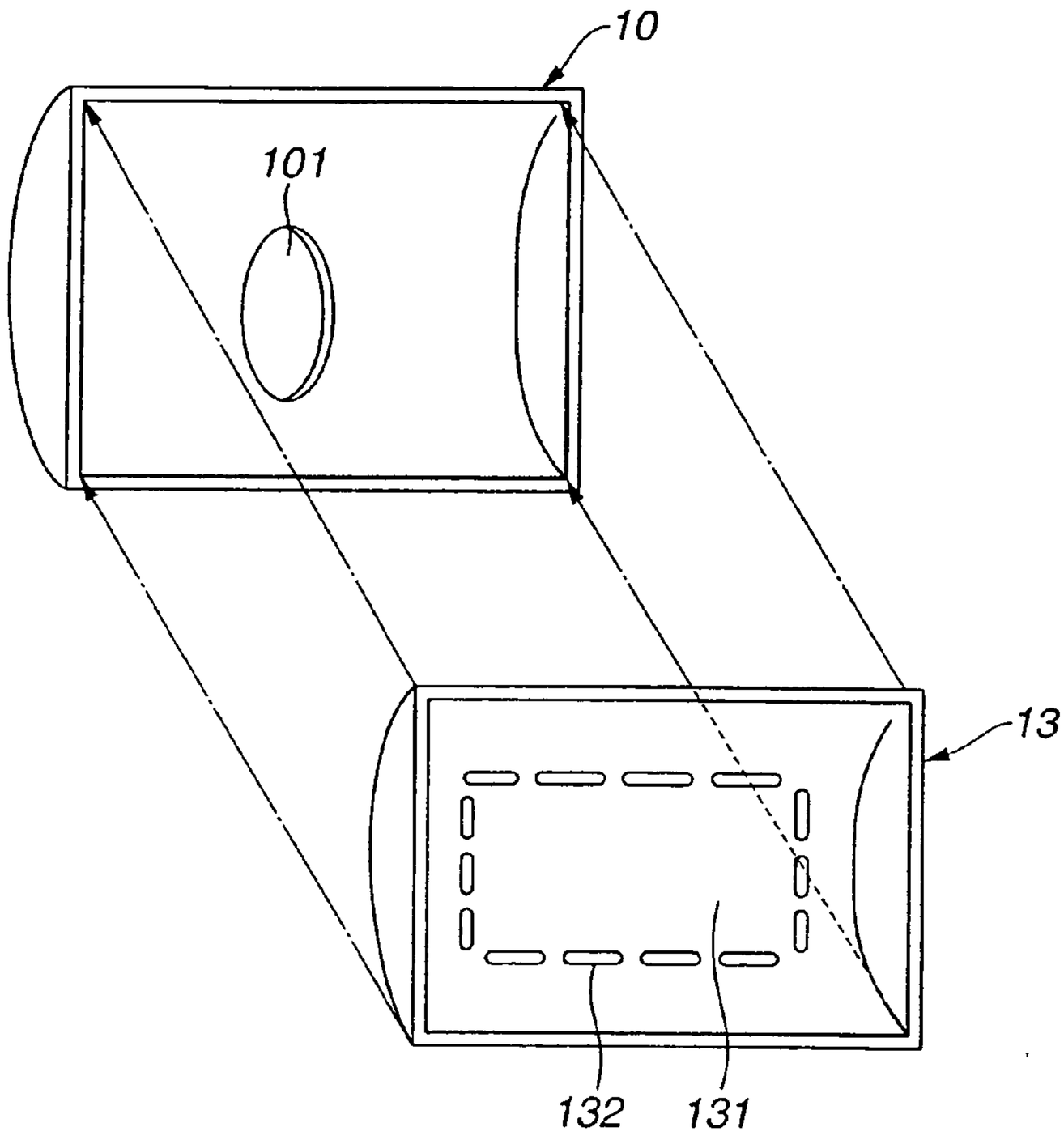


FIG.9

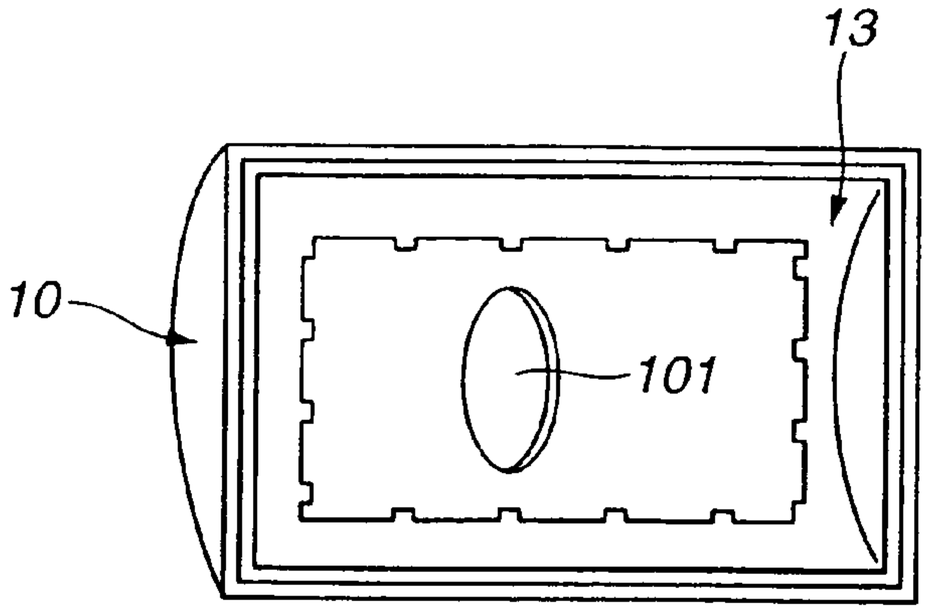


FIG.10

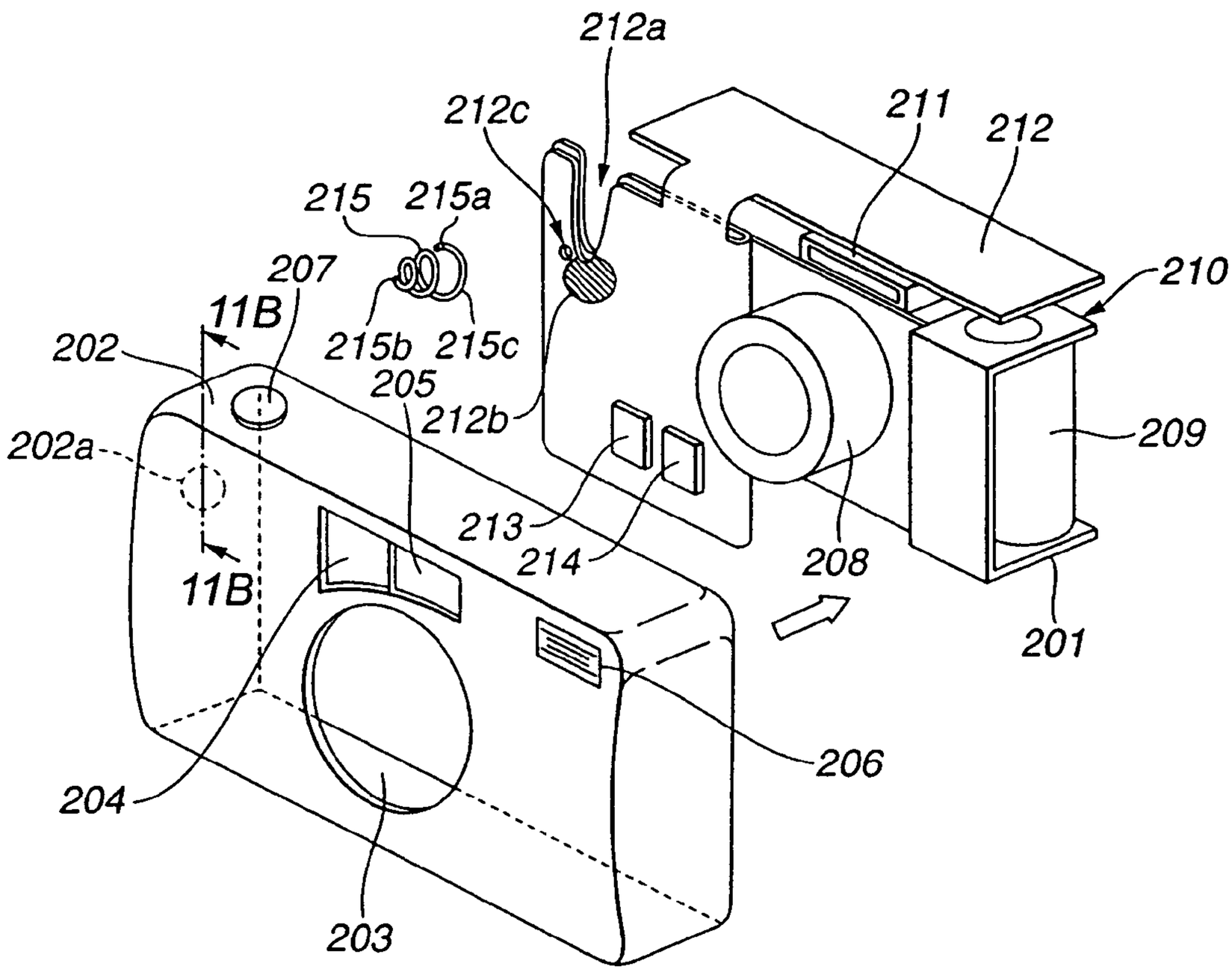

212a
212c
211
212
215
215a
207
210
11B
202
215b
215c
205
212b
209
202a
213
214
208
11B
201
206
204
203

FIG.11A

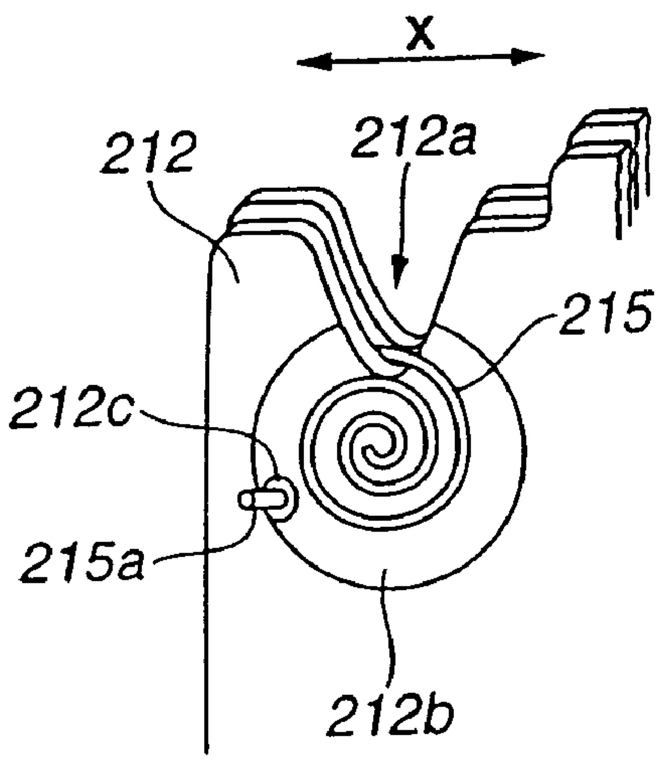


FIG.11B

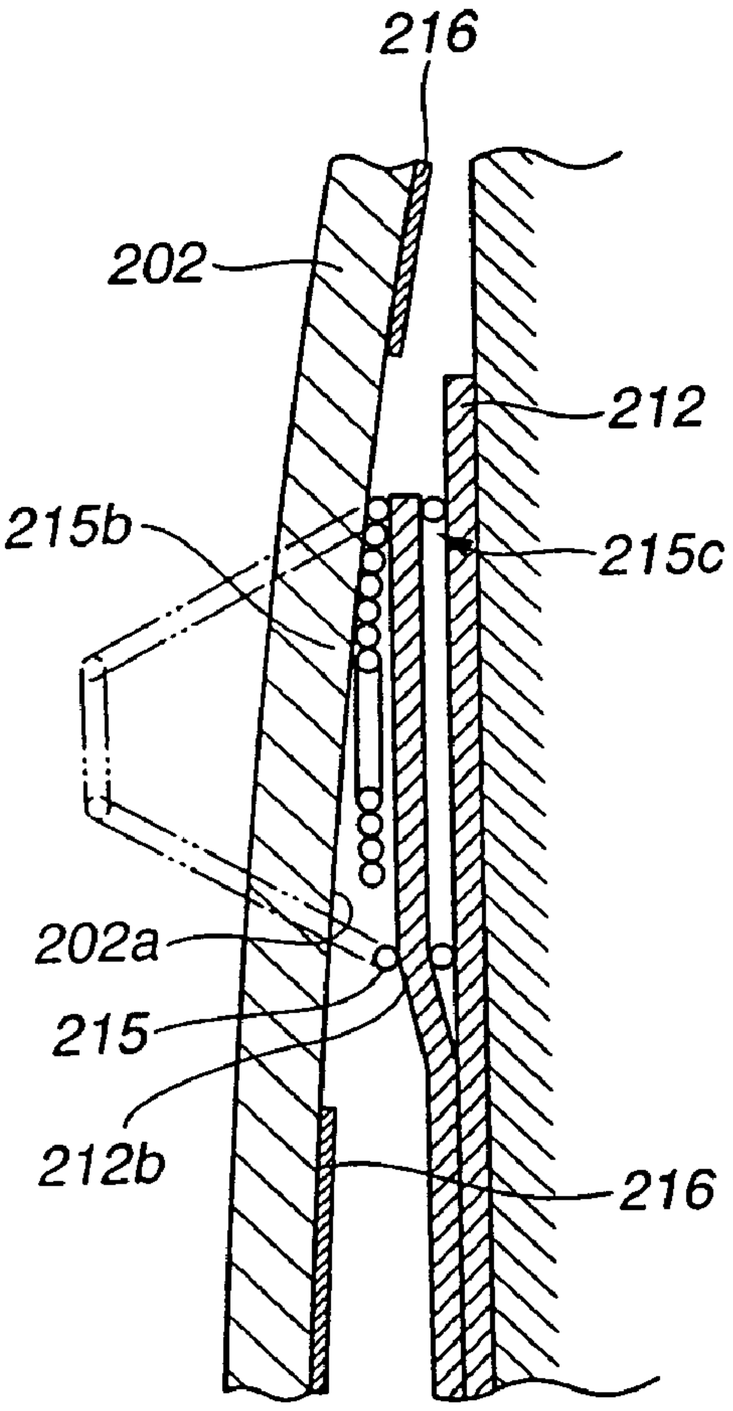


FIG.12

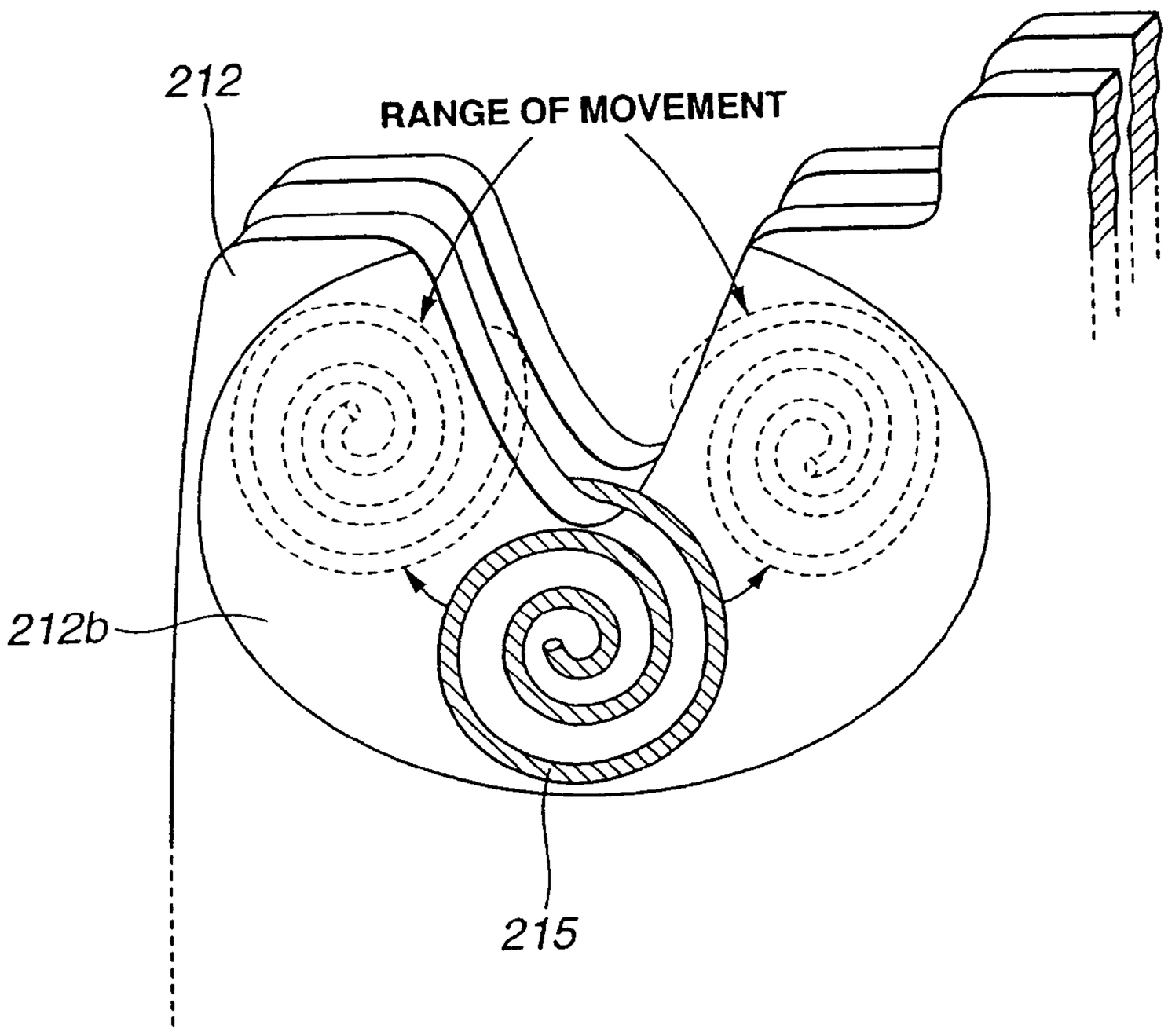


FIG.13

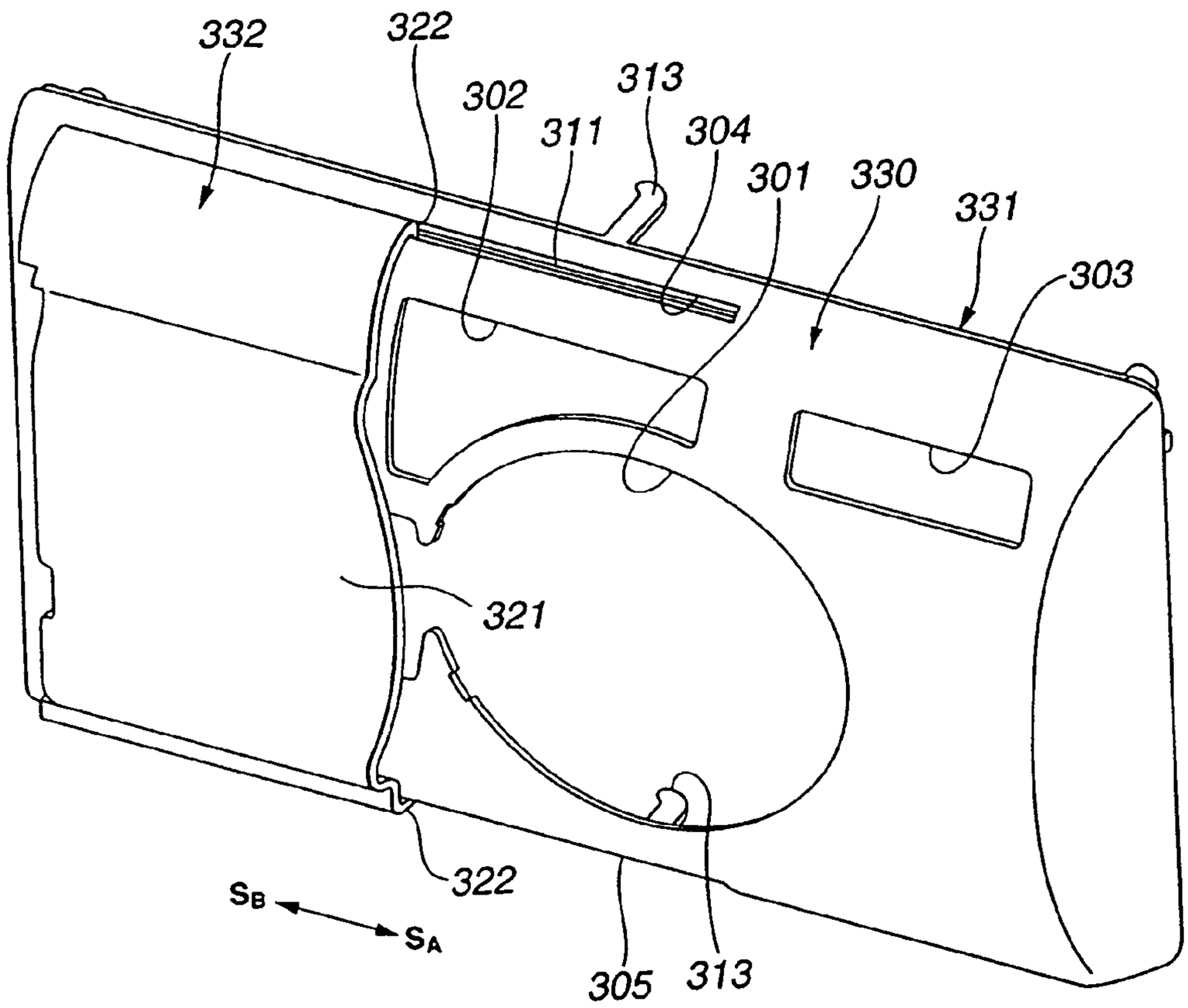


FIG.14

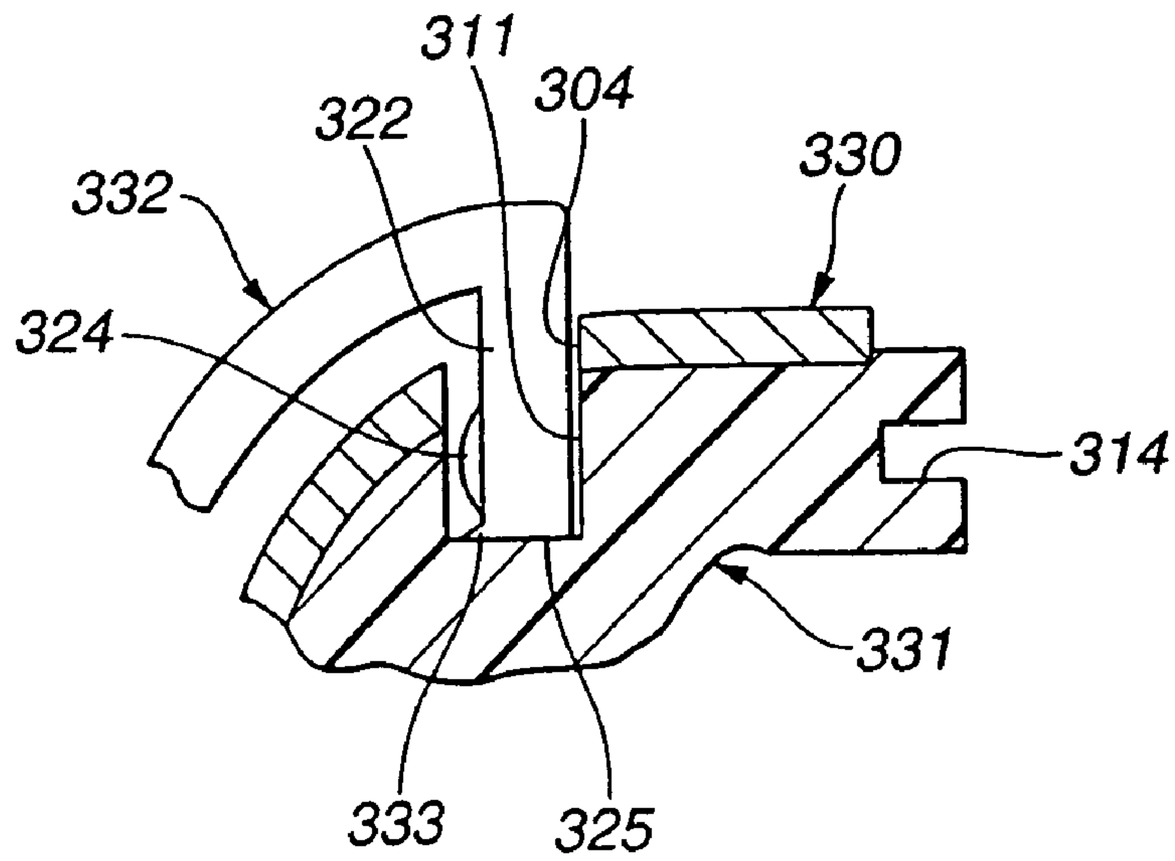

311
304
322
330
332
324
314
331
333
325

FIG.15

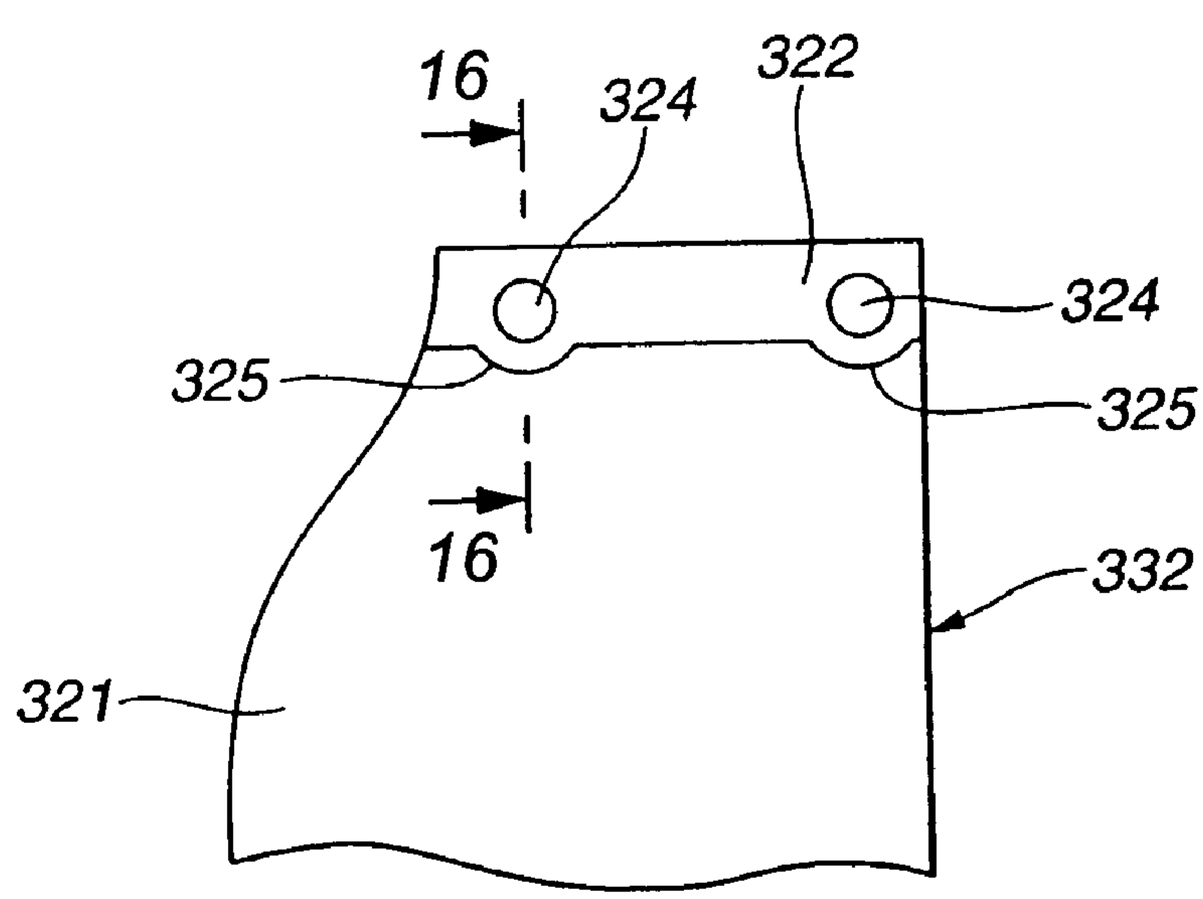

16
324
322
324
325
325
16
332
321

FIG.16

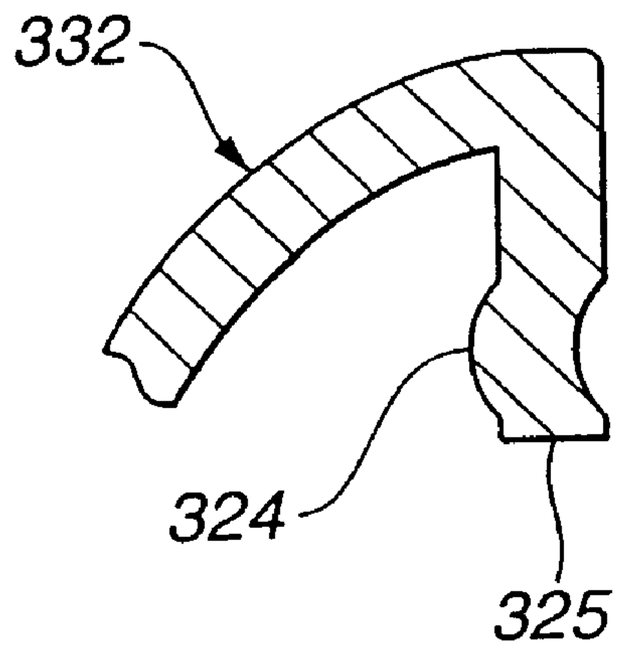


FIG.17

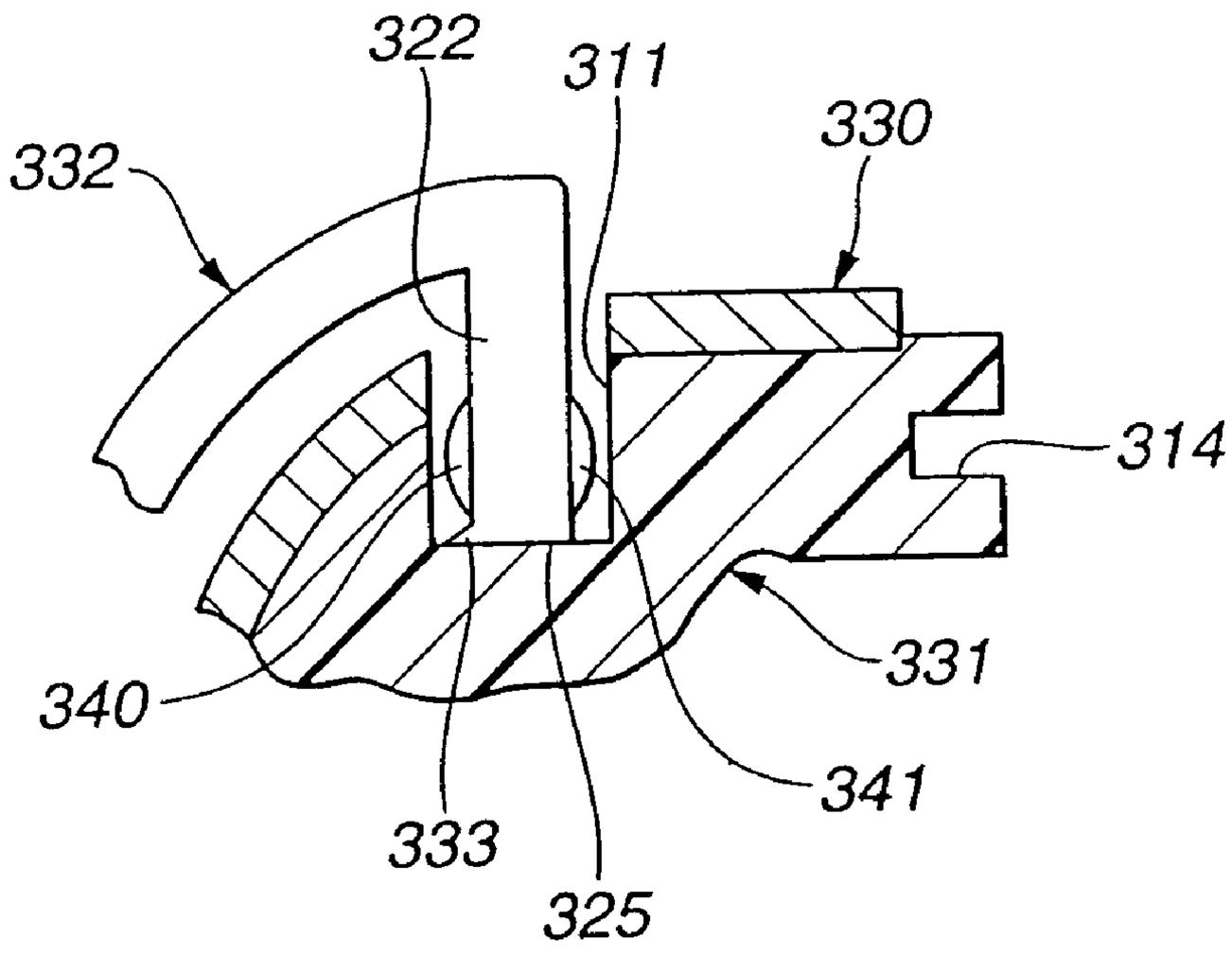


FIG.18

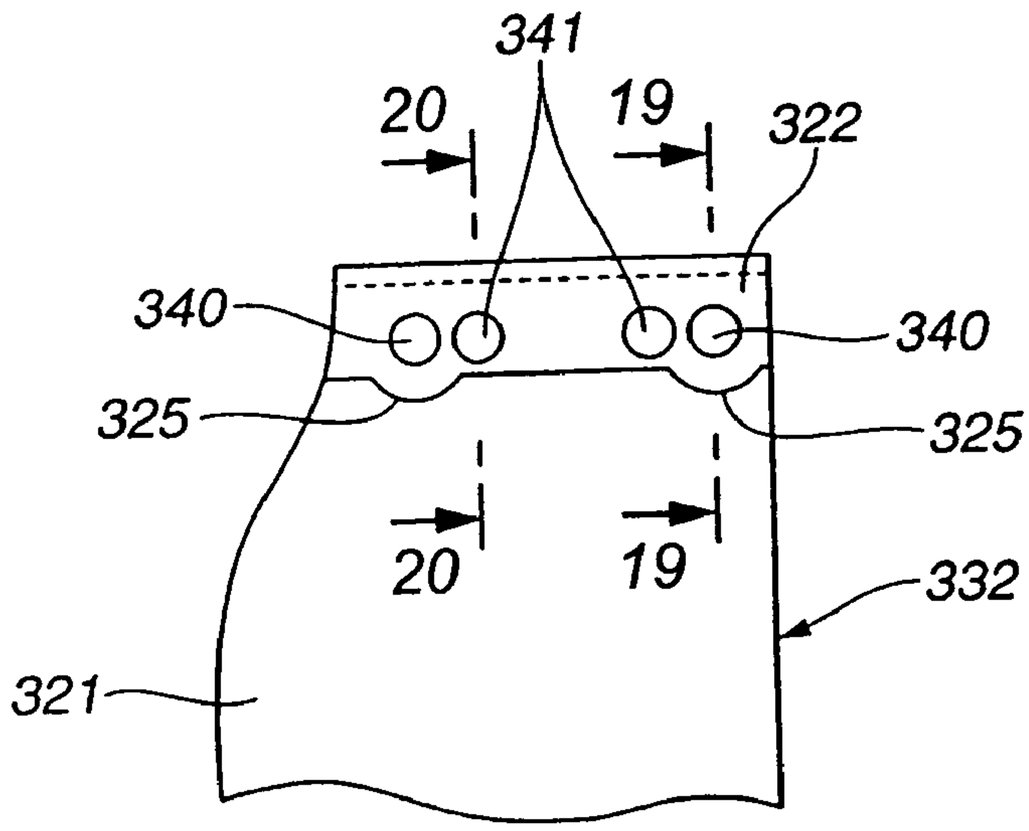


FIG.19

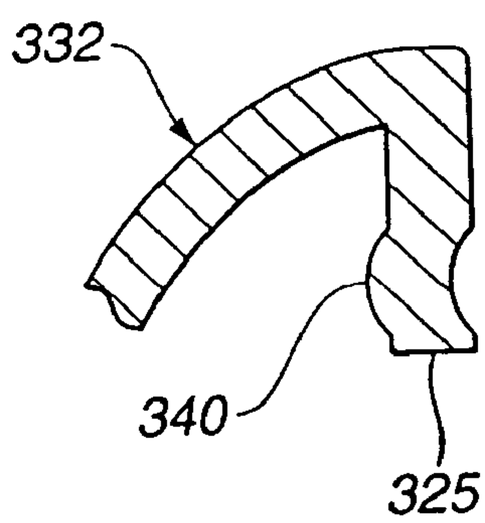


FIG.20

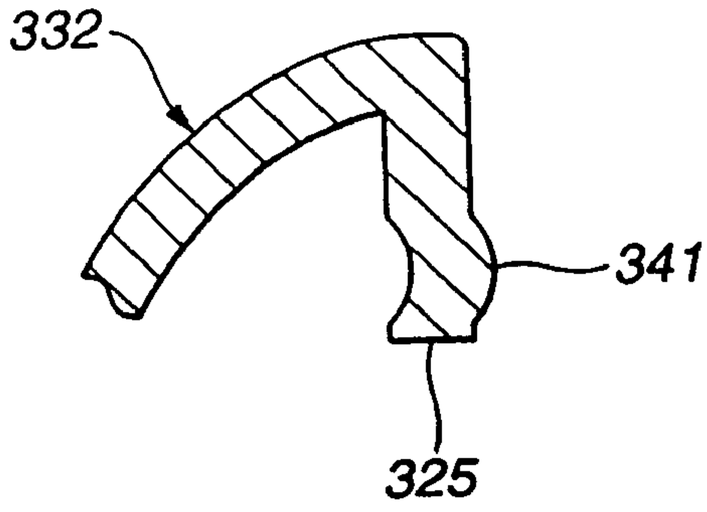


FIG.21

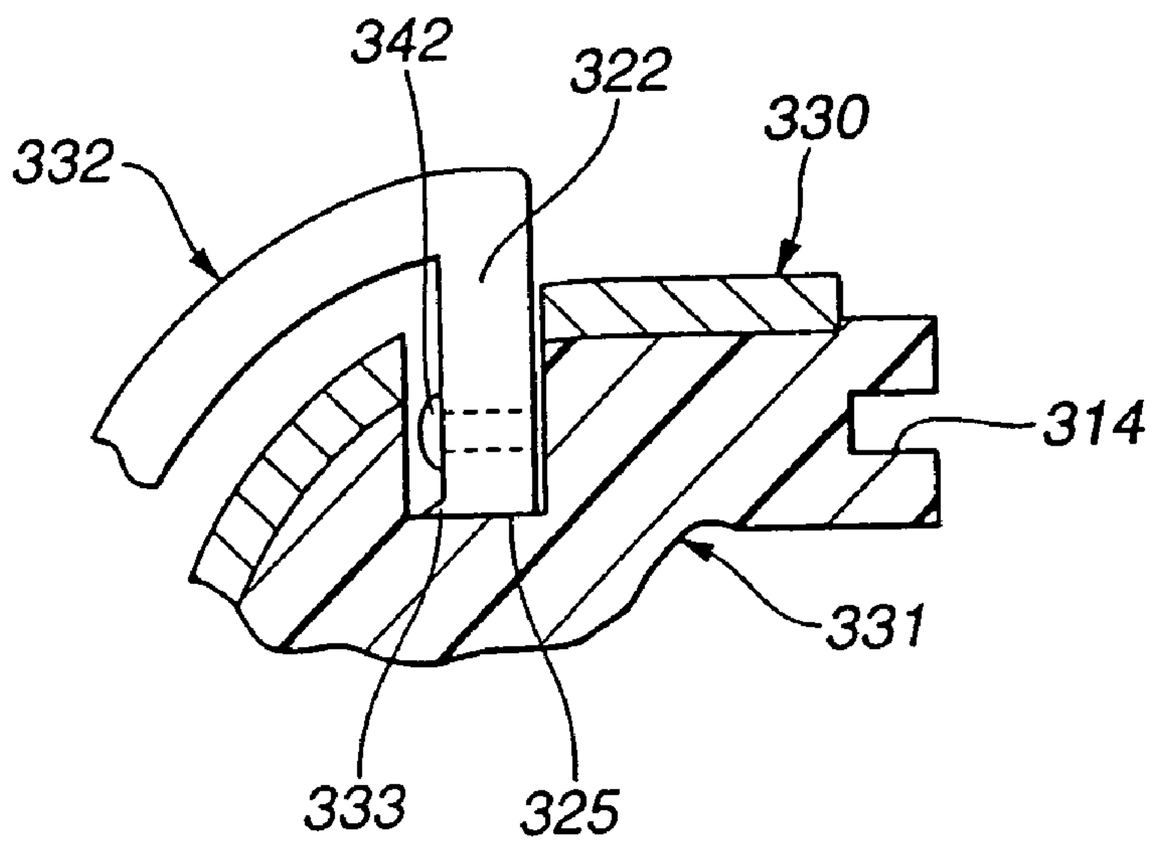


FIG.22

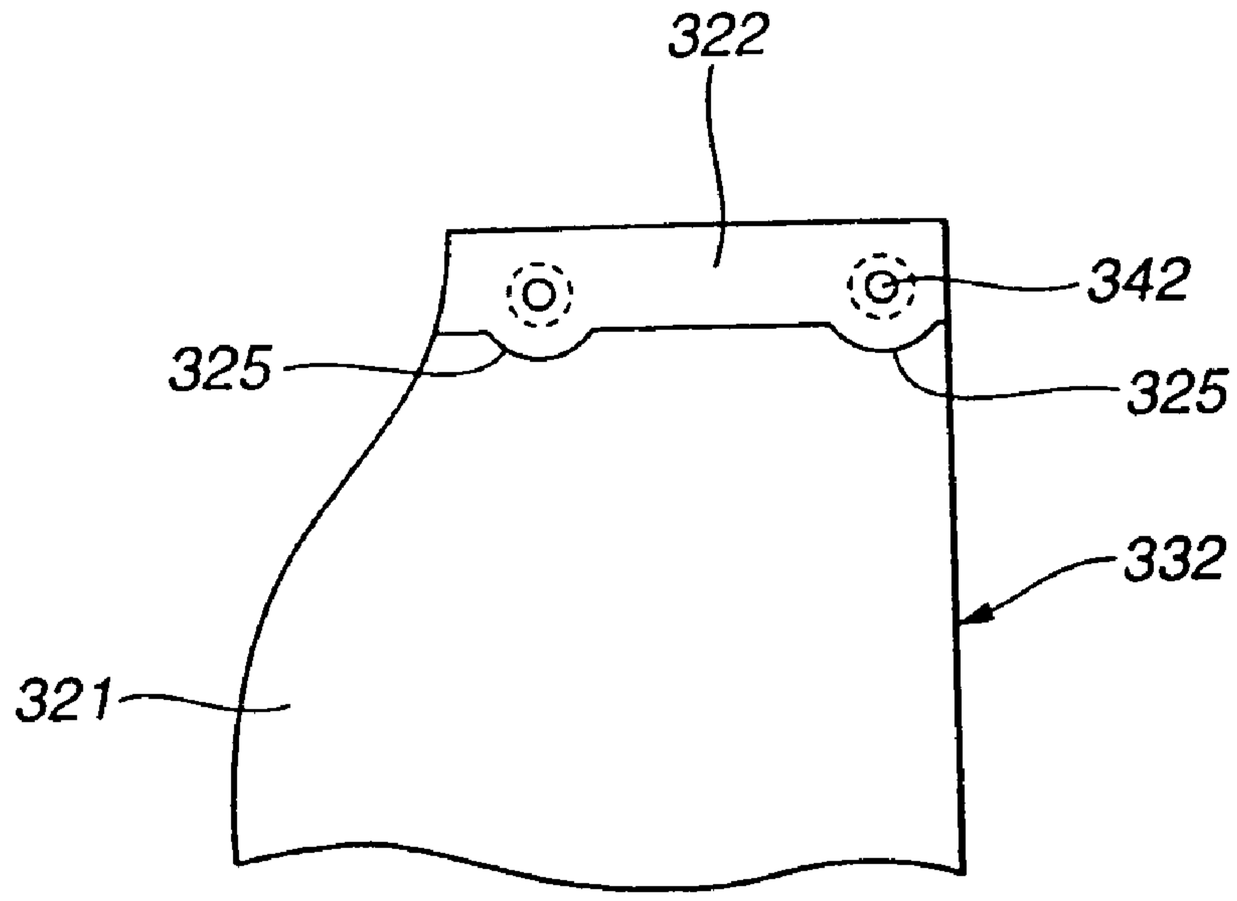


FIG.23

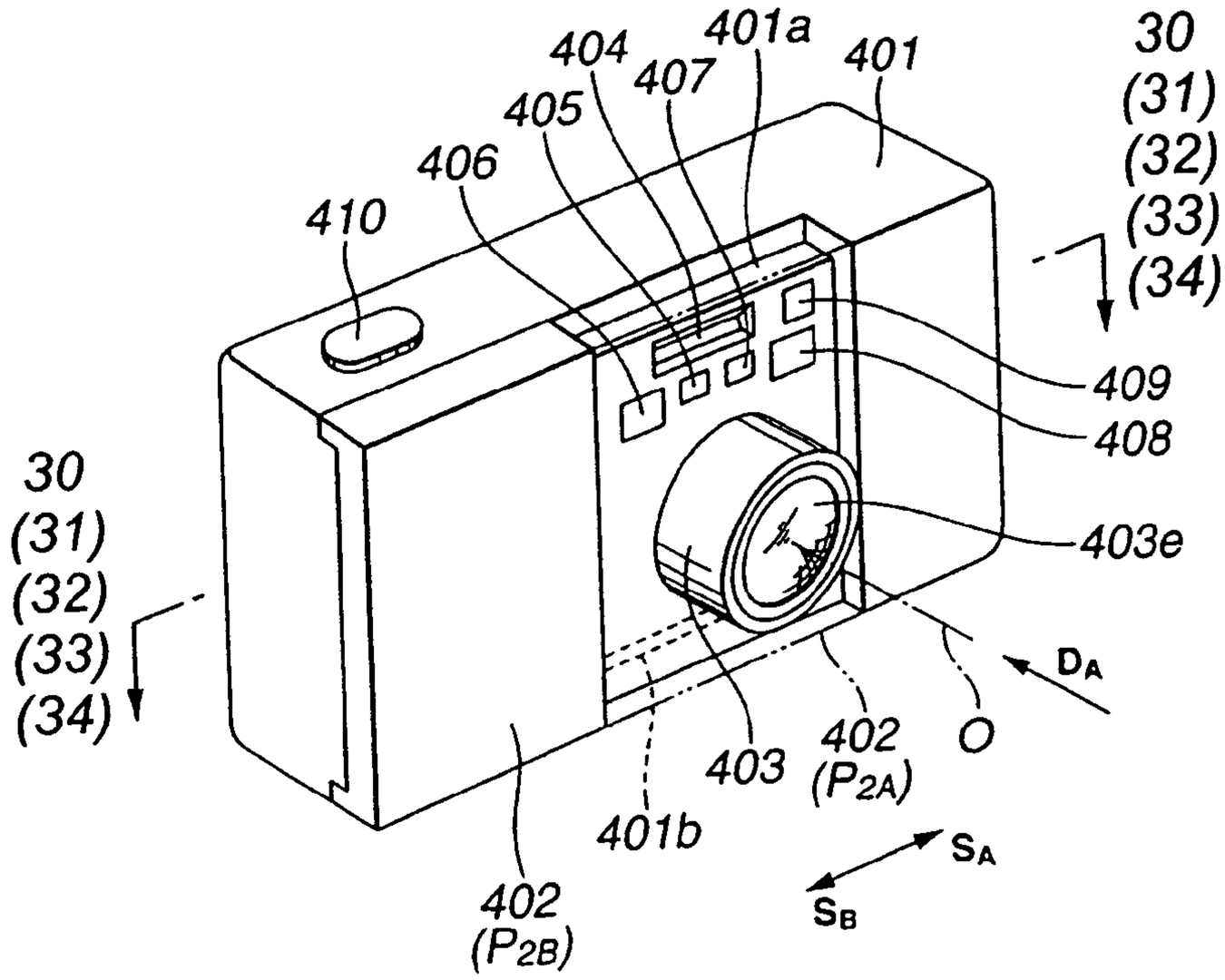

404
401a
407
401
405
406
410
30
(31)
(32)
(33)
(34)
409
408
403e
D_A
403
402
(P_{2A})
O
401b
S_A
S_B
402
(P_{2B})

FIG.24

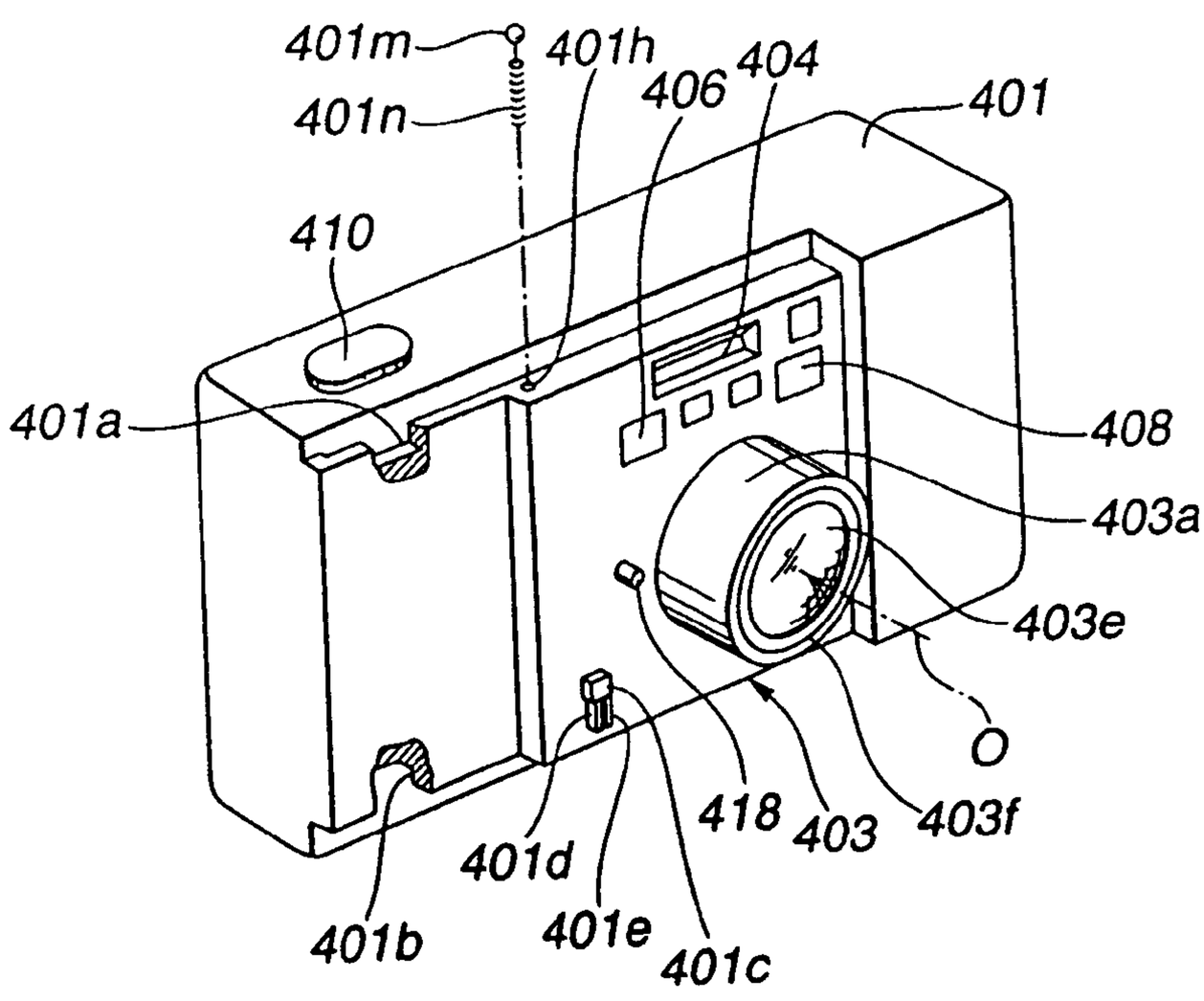

401m
401h
406
404
401
401n
410
401a
408
403a
403e
O
418
403
403f
401d
401b
401e
401c

FIG.25

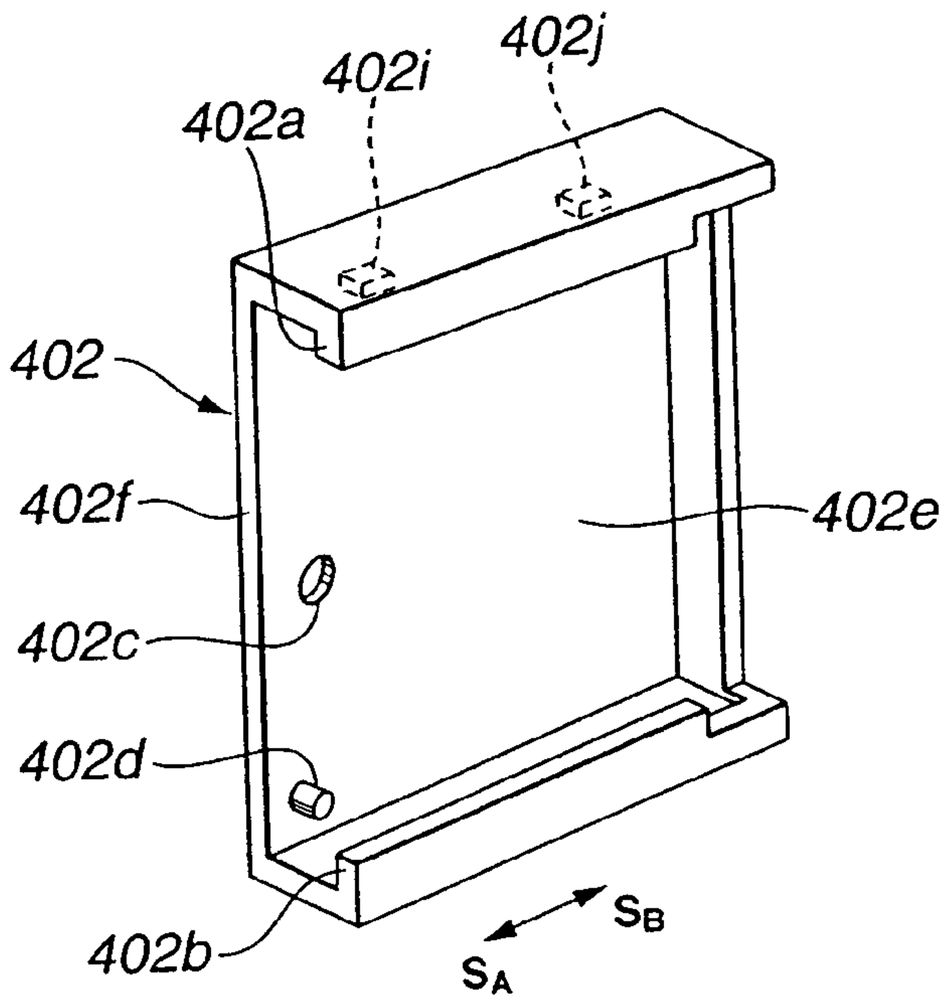

402j
402i
402a
402
402f
402c
402d
402b
402e
S_B
S_A

FIG.26

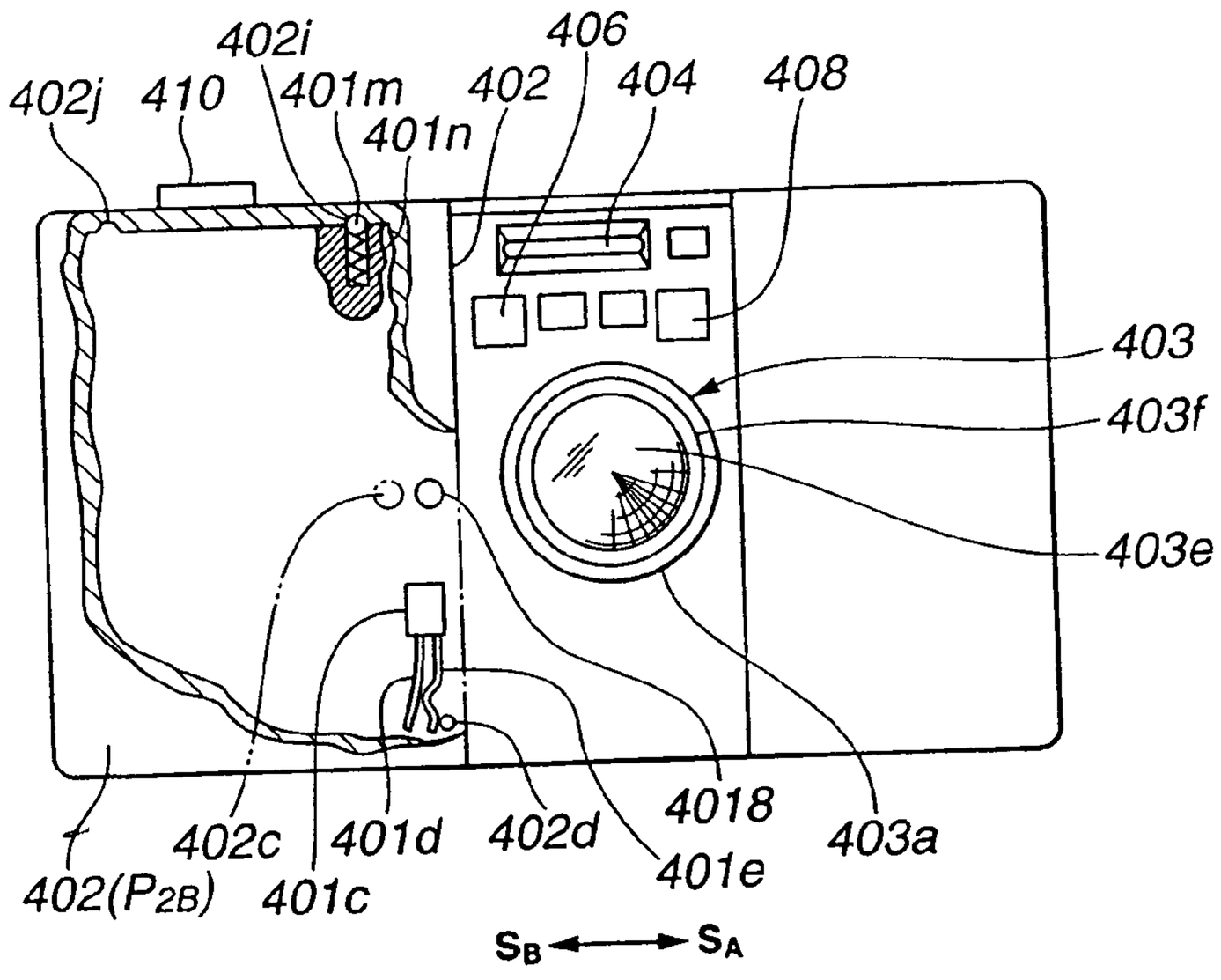

402j
410
402i
401m
401n
402
406
404
408
403
403f
403e
402(P2B)
401c
402c
401d
402d
401e
4018
403a
S_B
S_A

FIG.27

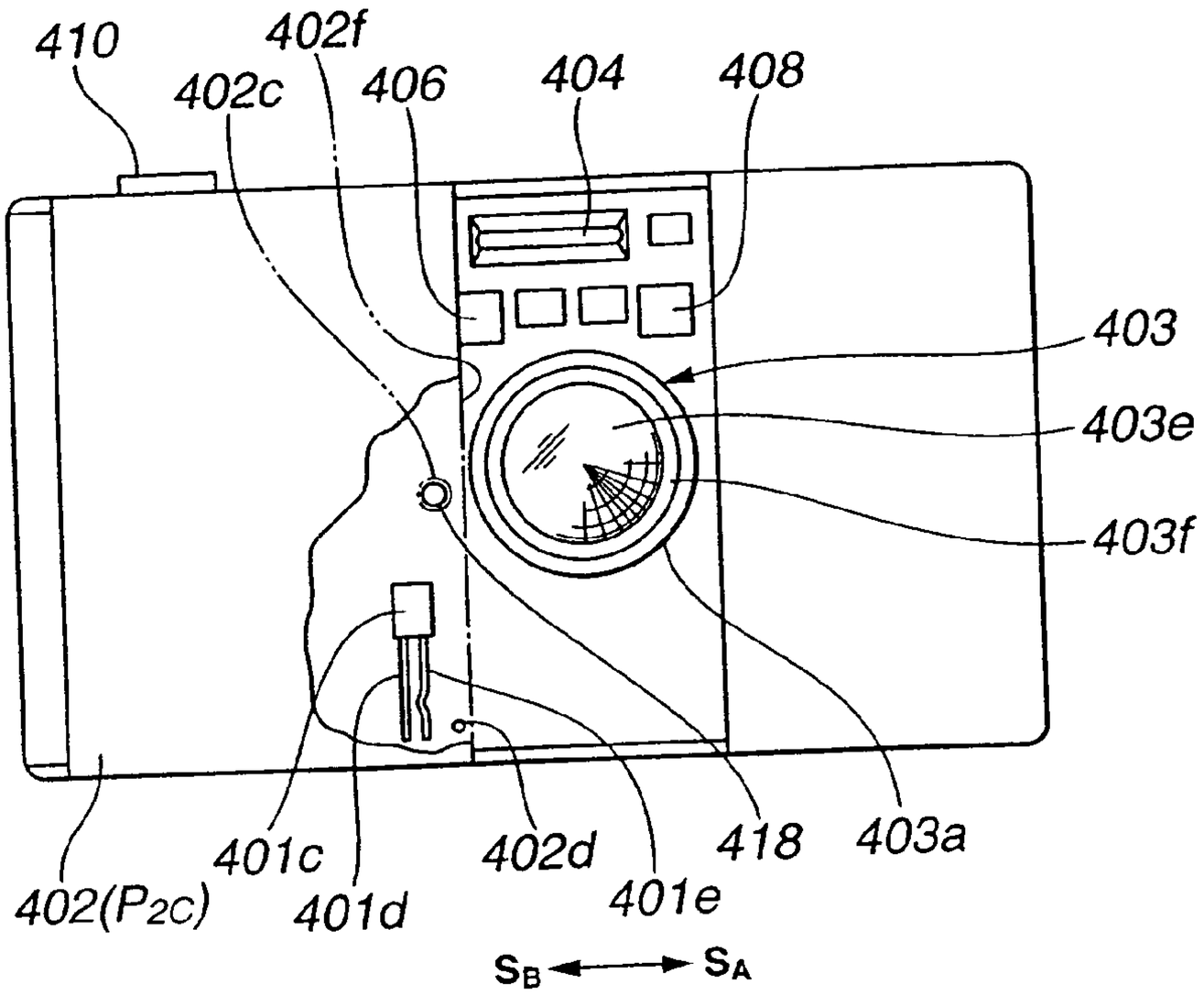

410
402f
402c
406
404
408
403
403e
403f
403a
418
402d
401c
401d
401e
402(P2C)
SB
SA

FIG.28

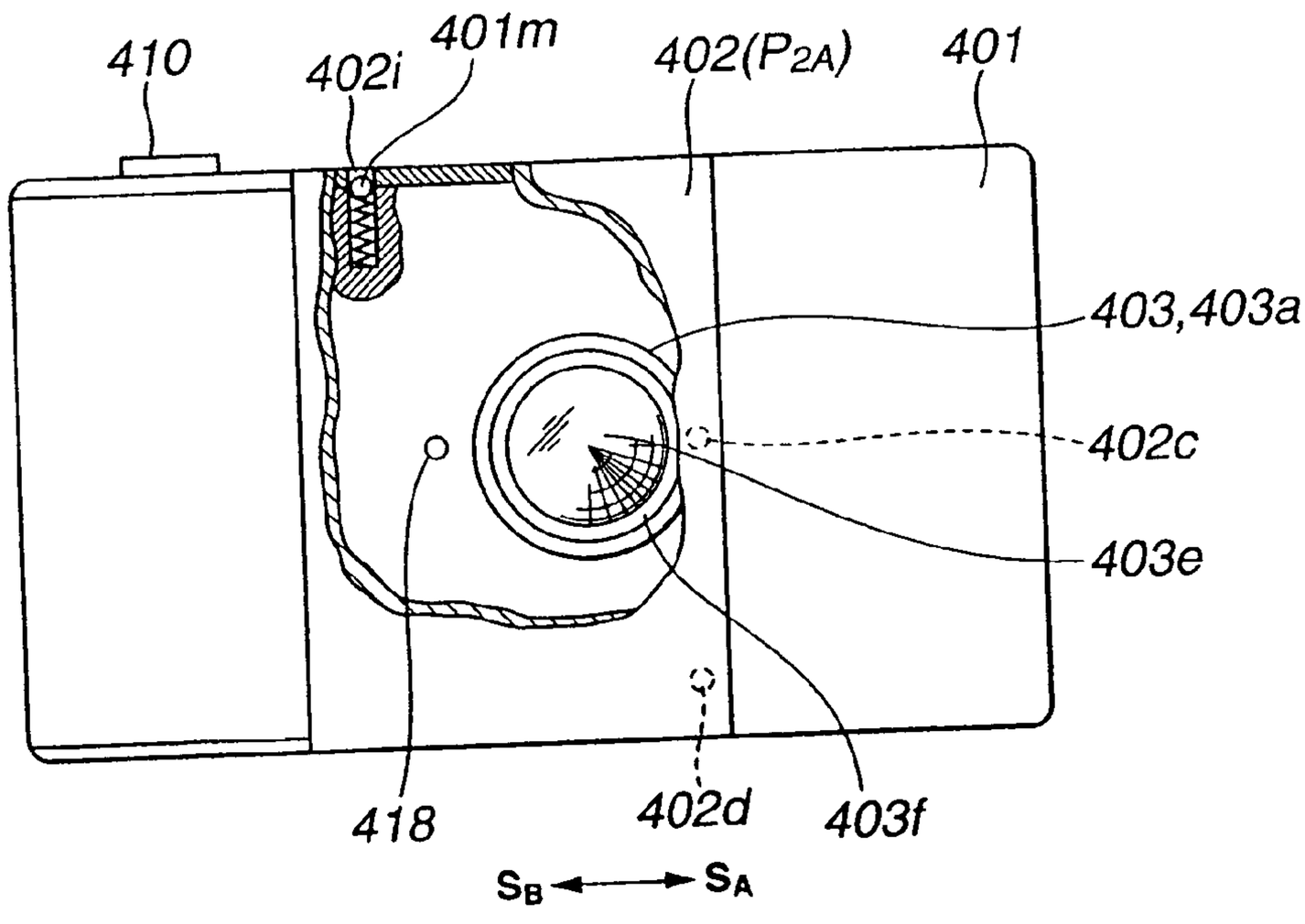
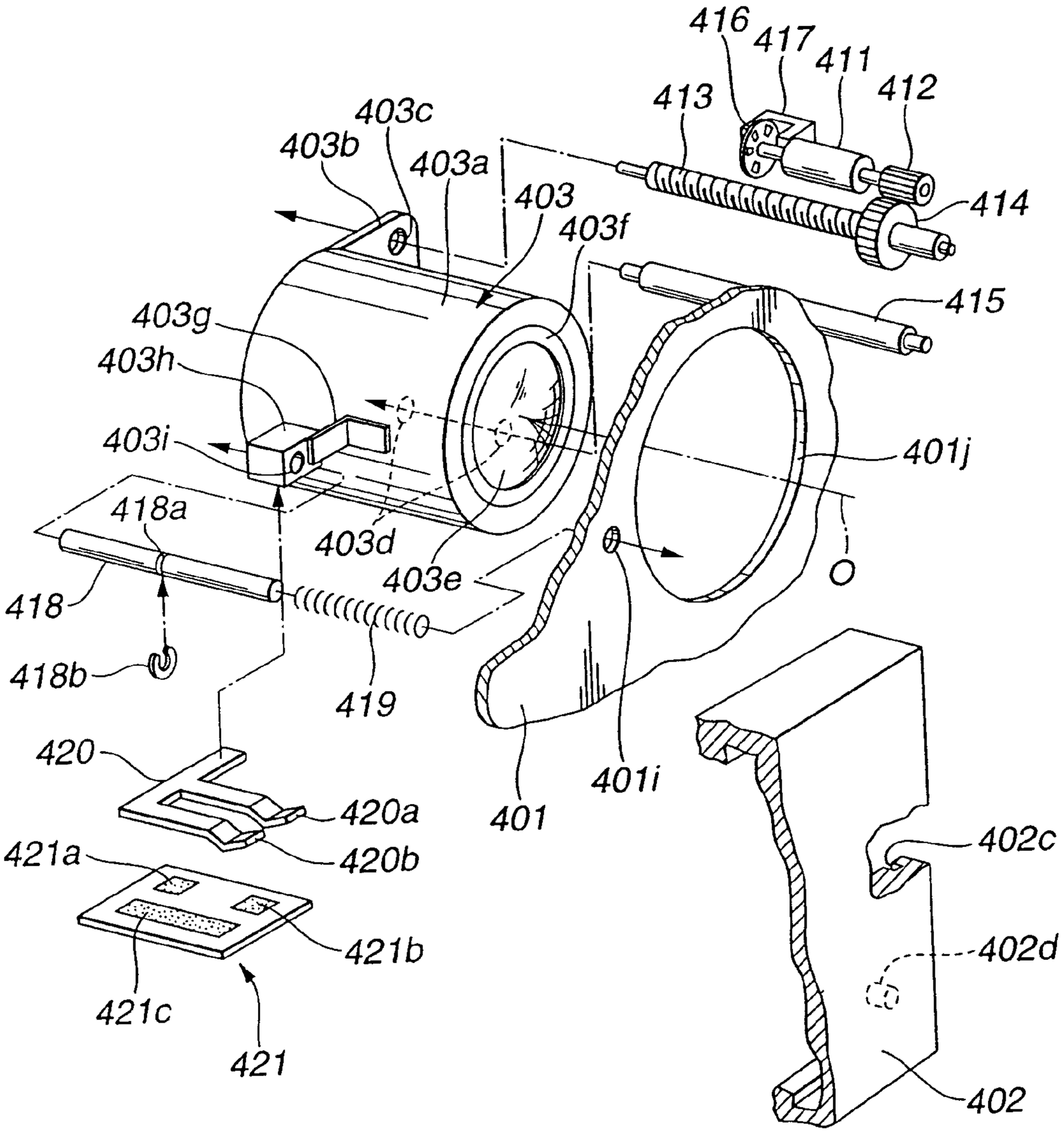

410
402i
401m
402(P2A)
401
403,403a
402c
403e
418
402d
403f
SB
SA

FIG.29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417
411
412
413
414
403c
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403a
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403f
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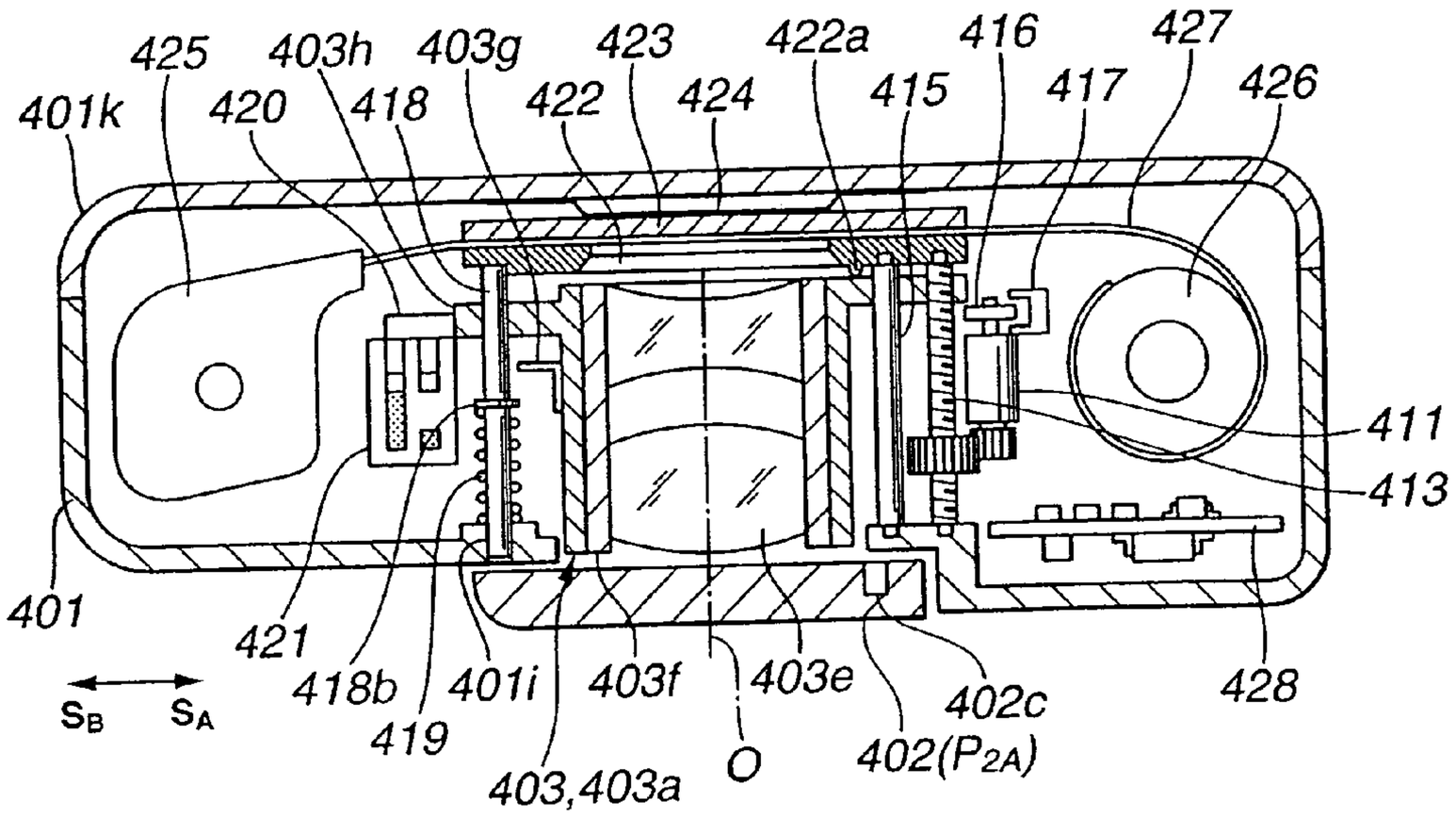
403g
403h
403i
401j
418a
403d
403e
418
418b
419
O
420
420a
420b
421a
421b
421c
421
401
401i
402c
402d
402

FIG.30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425
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403h
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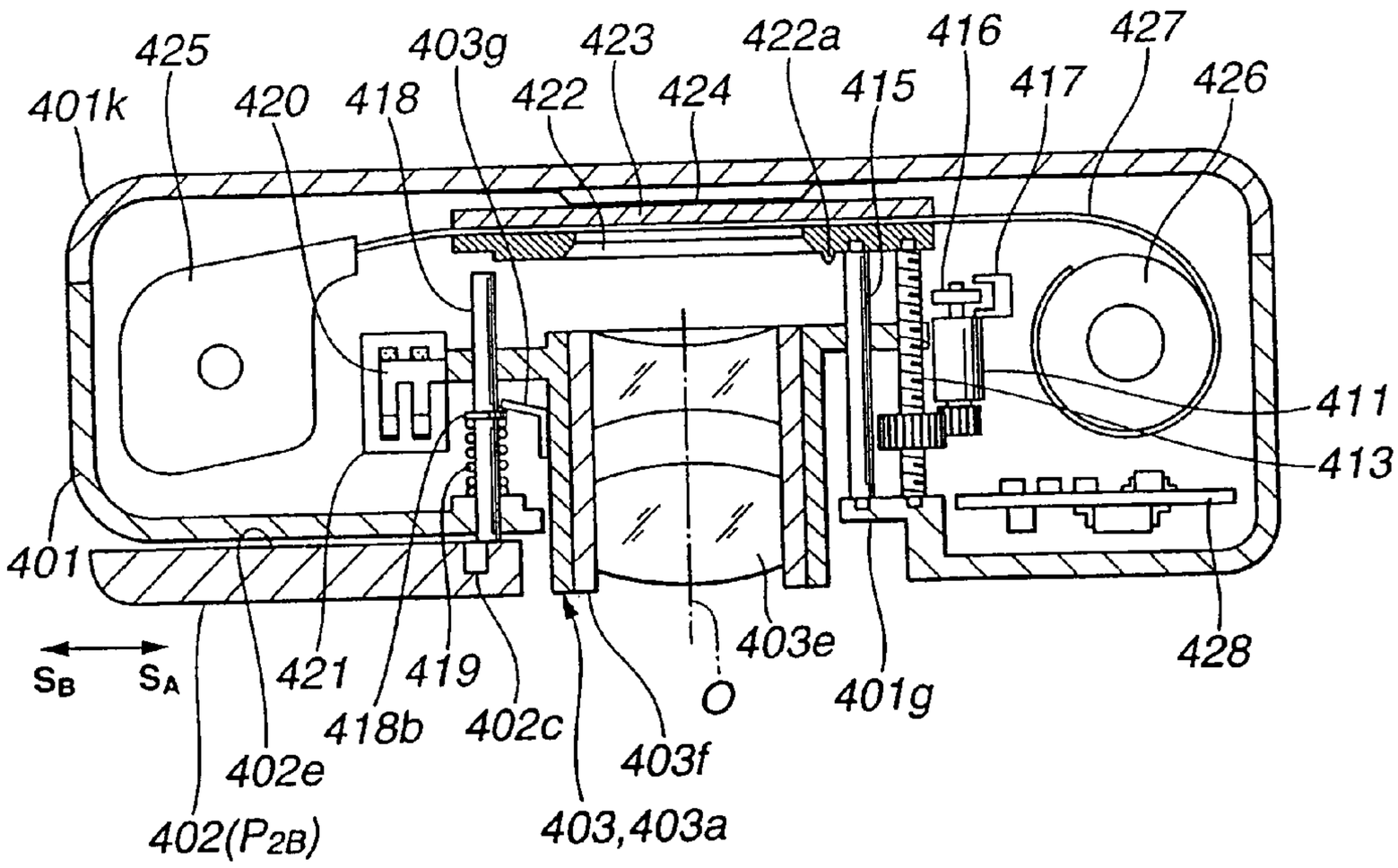
403g
422
423
424
422a
415
416
417
427
426
411
413
401
421
418b
419
401i
403,403a
403f
O
403e
402(P2A)
402c
428
SB
SA

FIG.31


401k
425
420
418
403g
422
423
424
422a
415
416
417
427
426
411
413
401
421
418b
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402c
402e
402(P2B)
403,403a
403f
O
403e
401g
428
SB
SA

FIG.32

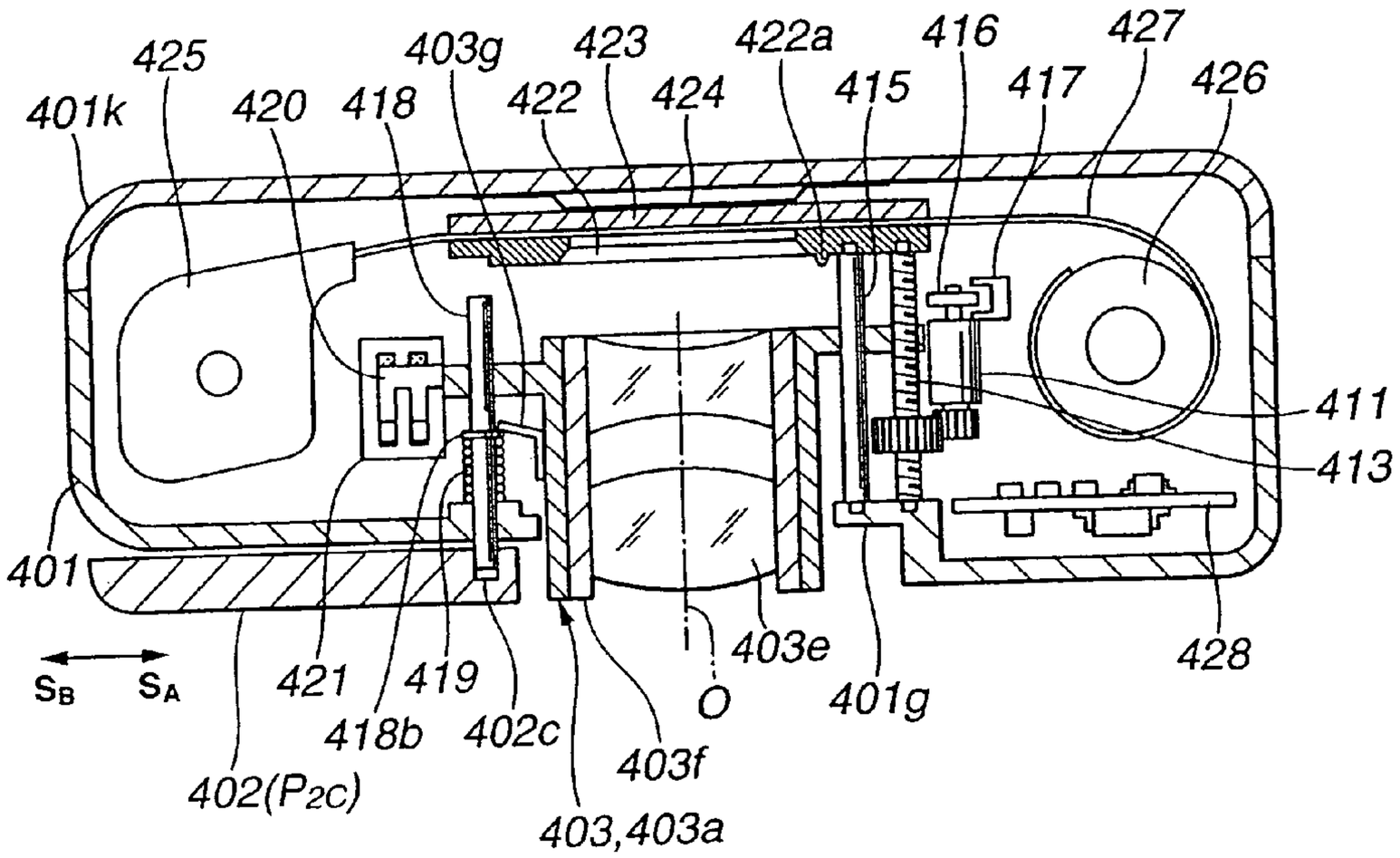

401k
425
420
418
403g
422
423
424
422a
415
416
417
427
426
411
413
401
428
403e
O
401g
403f
403,403a
402(P2c)
418b
402c
421
419
SB
SA

FIG.33

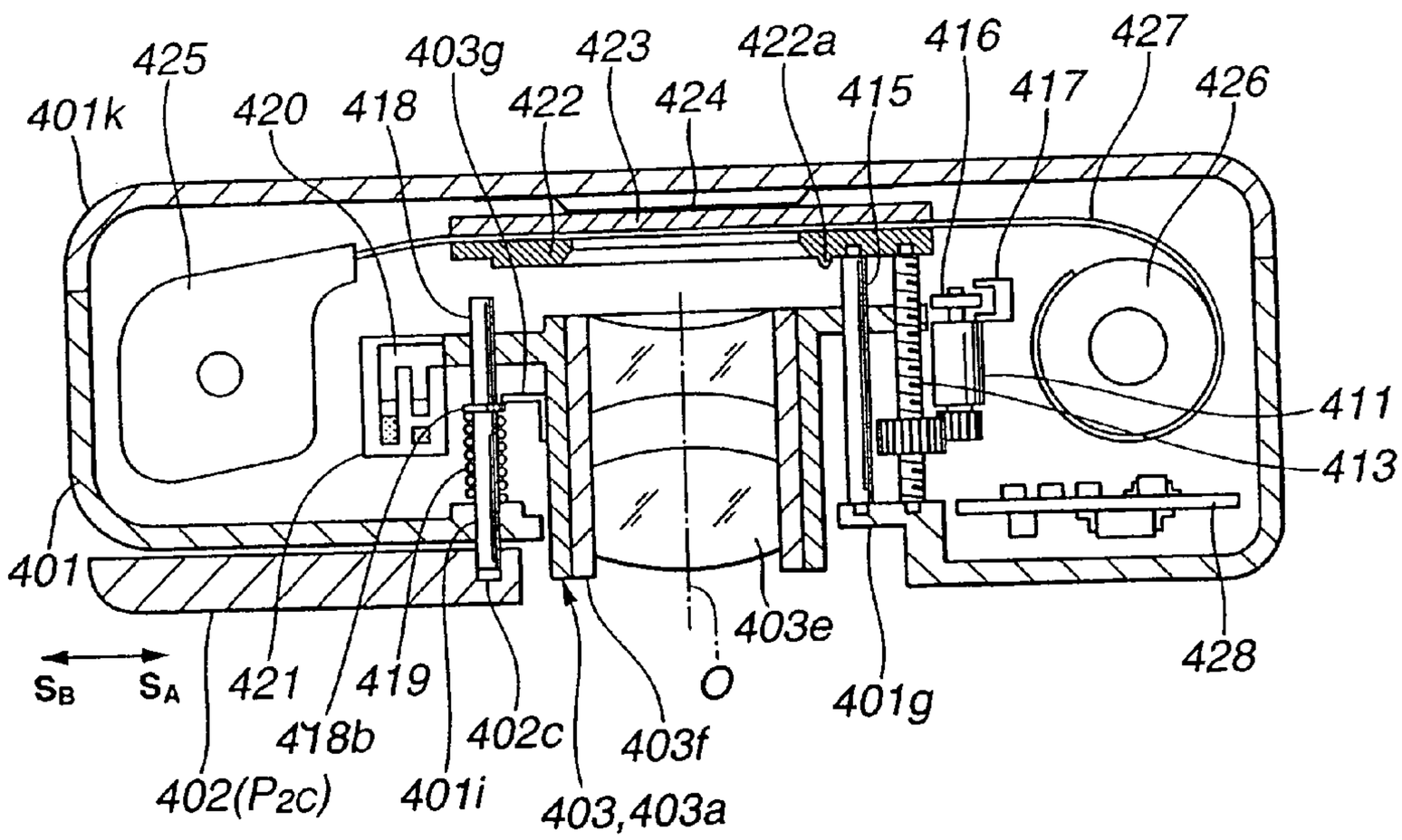

401k
425
420
418
403g
422
423
424
422a
415
416
417
427
426
411
413
401
428
403e
O
401g
403f
403,403a
402(P2c)
418b
402c
401i
421
419
SB
SA

FIG.34

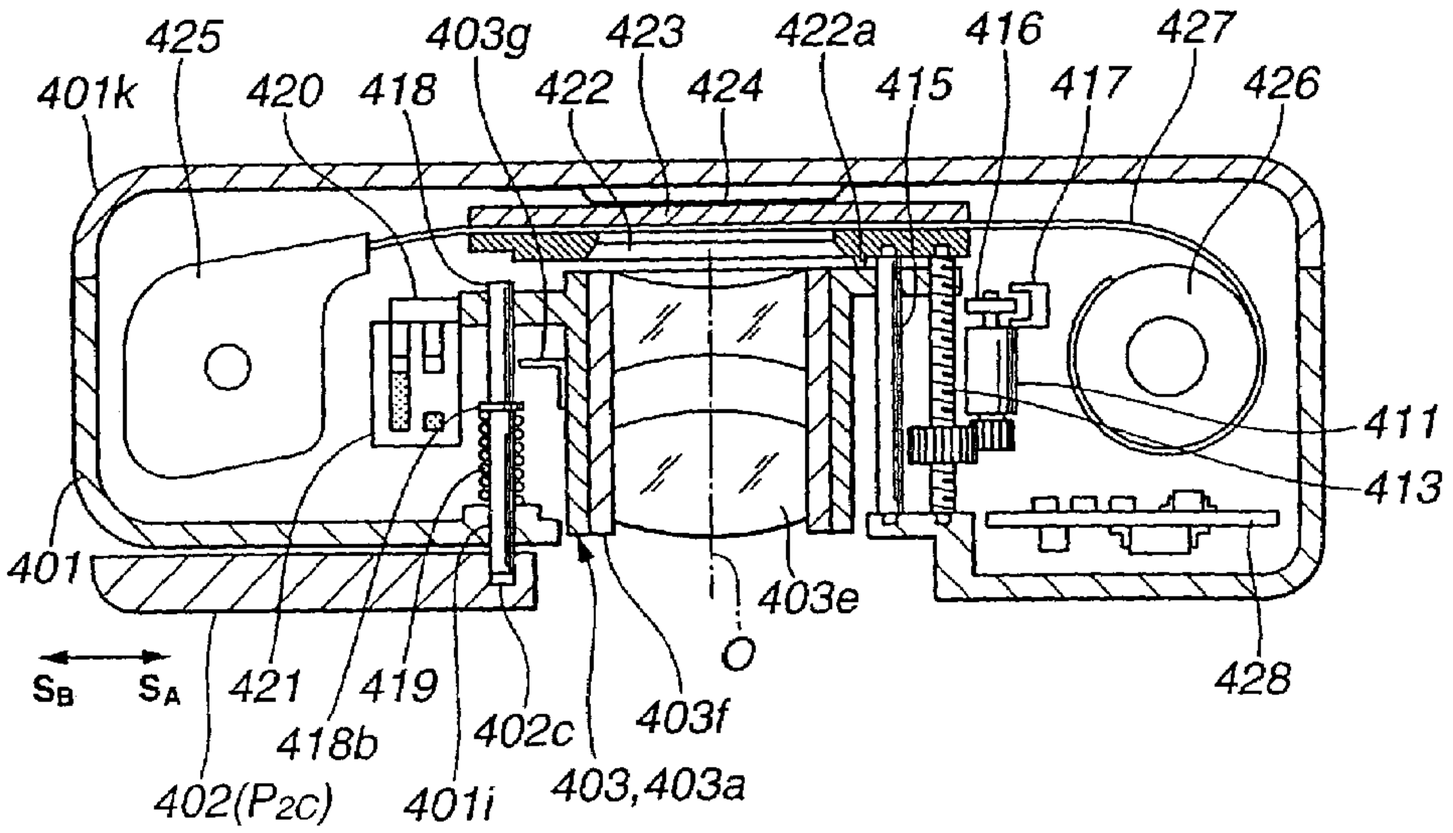

425
403g
423
422a
416
427
401k
420
418
422
424
415
417
426
411
413
401
403e
O
428
S_B
S_A
421
419
418b
402c
403f
402(P_{2c})
401i
403,403a

FIG.35

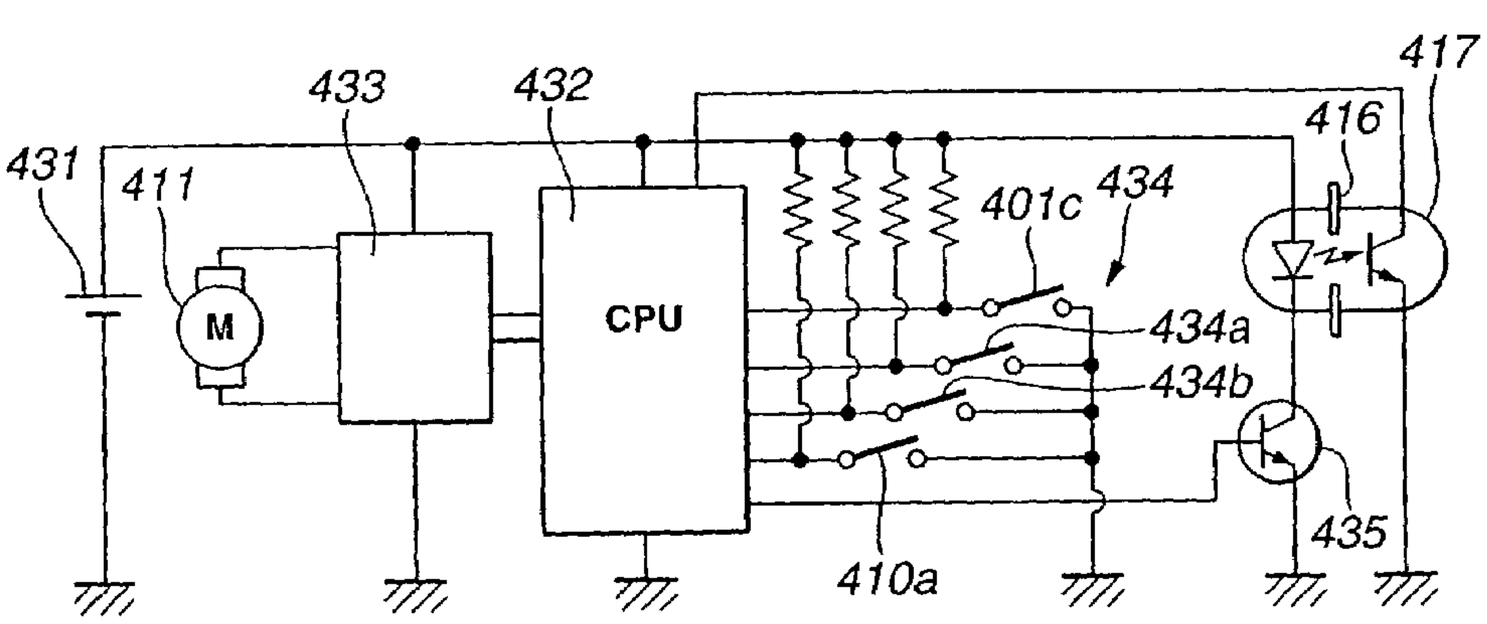

433
432
417
431
411
416
401c
434
M
CPU
434a
434b
435
410a

FIG.36

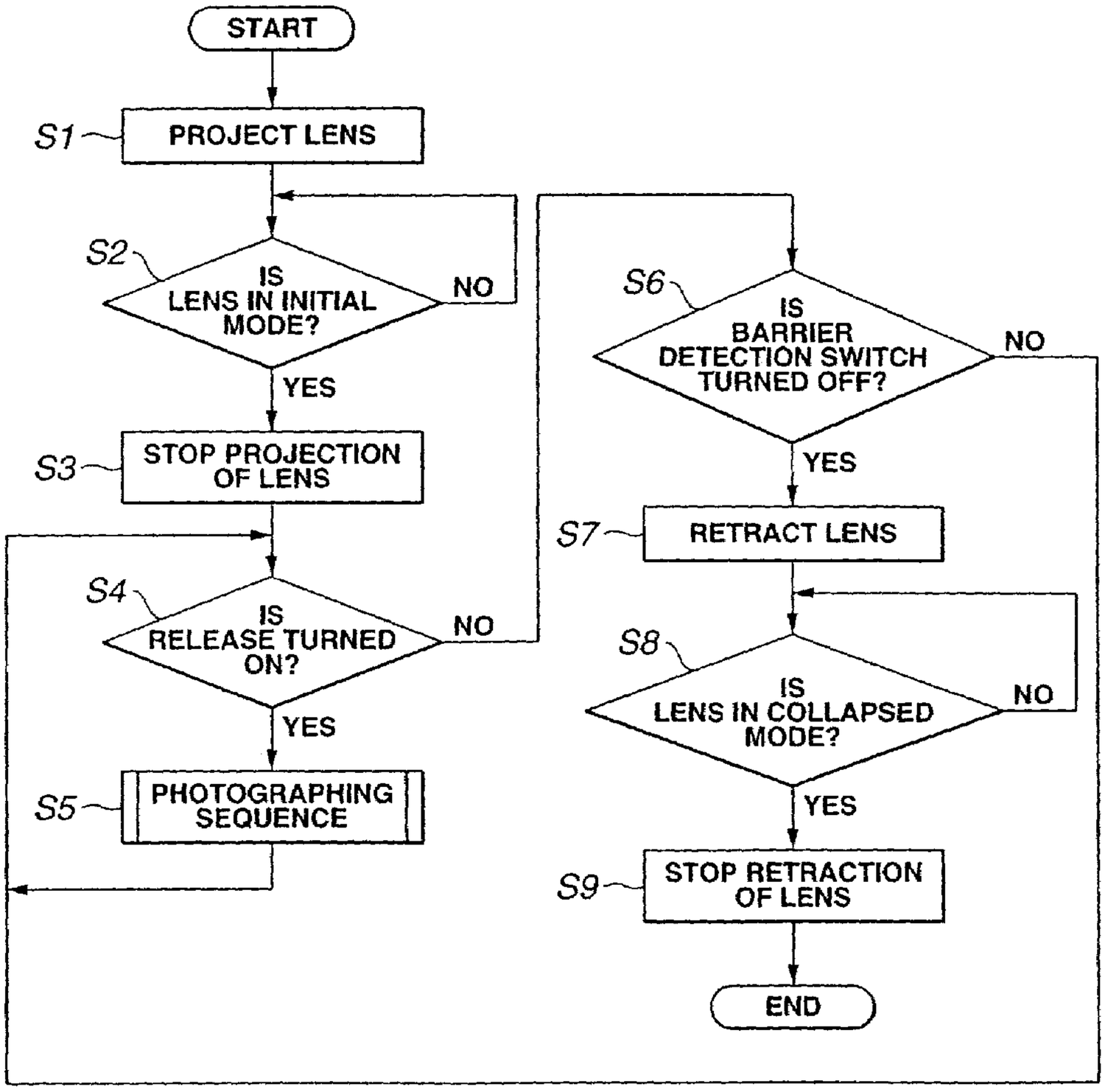

START
S1
PROJECT LENS
S2
IS LENS IN INITIAL MODE?
NO
YES
S3
STOP PROJECTION OF LENS
S4
IS RELEASE TURNED ON?
NO
YES
S5
PHOTOGRAPHING SEQUENCE
S6
IS BARRIER DETECTION SWITCH TURNED OFF?
NO
YES
S7
RETRACT LENS
S8
IS LENS IN COLLAPSED MODE?
NO
YES
S9
STOP RETRACTION OF LENS
END

FIG.37
RELATED ART

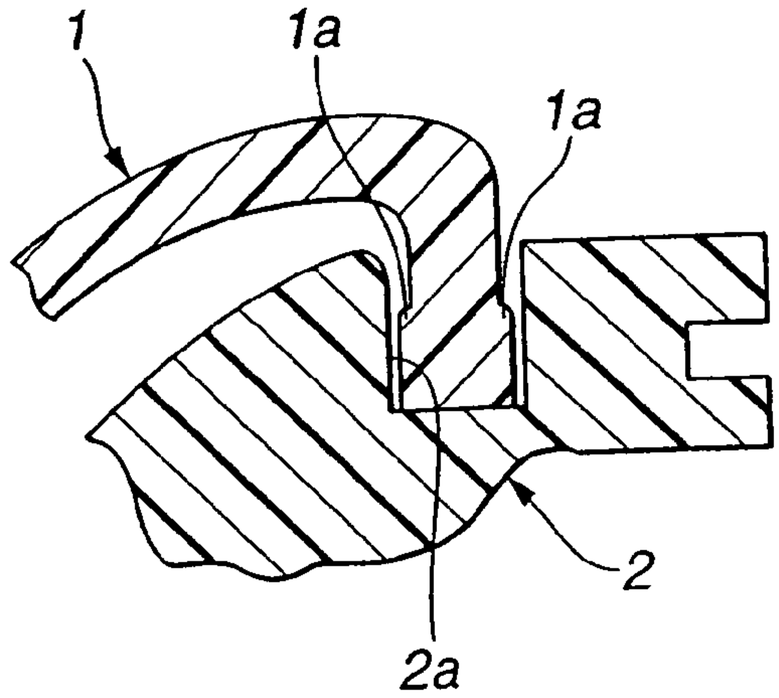
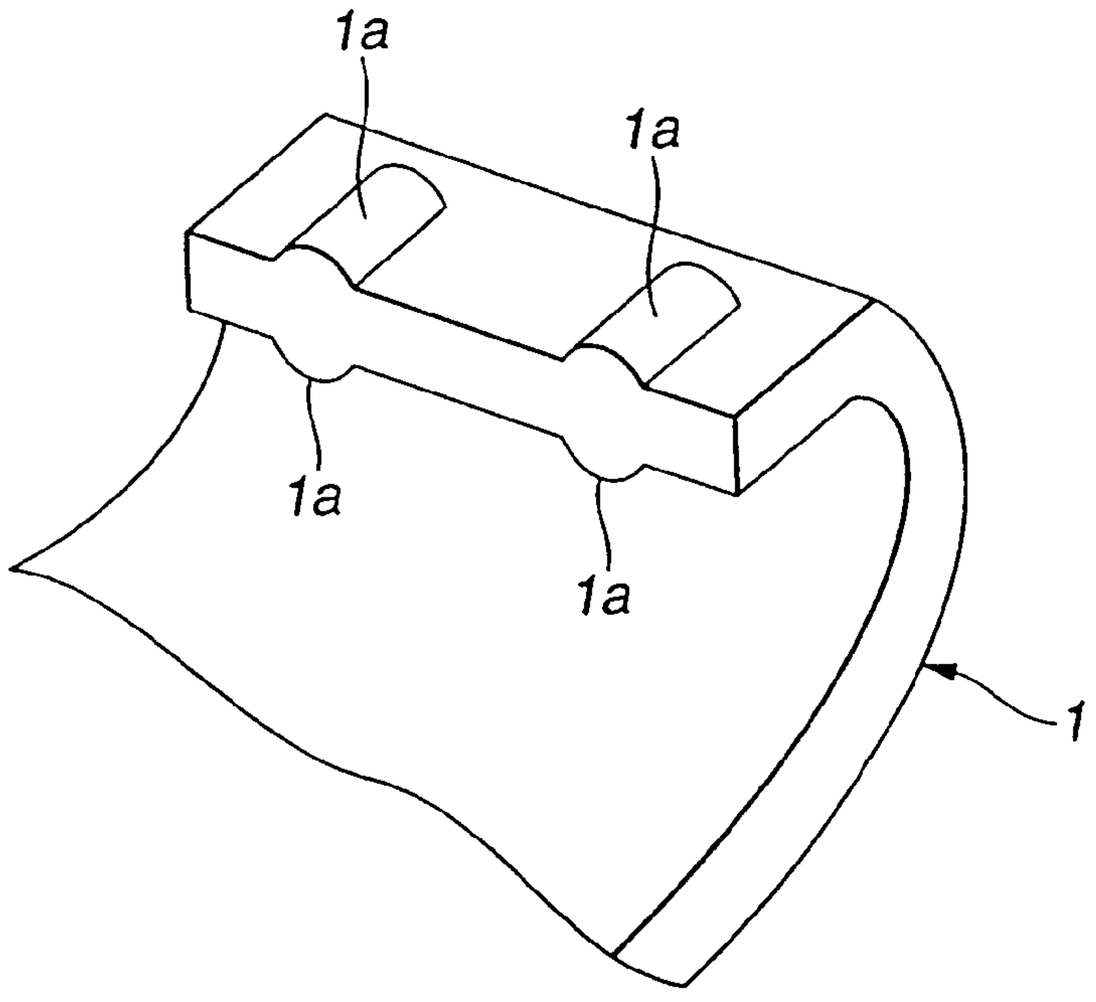


FIG.38
RELATED ART



CAMERA EXTERIOR PART AND CAMERA WITH LENS BARRIER

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a divisional application of U.S. application Ser. No. 10/408,594 filed Apr. 7, 2003, now U.S. Pat. No. 6,826,367. This application claims benefit of Japanese Application No. 2002-106888 filed in Japan on Apr. 9, 2002, No. 2002-119307 filed in Japan on Apr. 22, 2002, No. 2002-106900 filed in Japan on Apr. 9, 2002, and No. 2002-169004 filed in Japan on Jun. 10, 2002, the contents of which are incorporated by this reference.

BACKGROUND OF THE INVENTION

The present invention relates to a camera exterior part comprising an exterior member made of a metal and an inner frame member made of a resin, the inner frame member being arranged on the inner surface of the exterior member, a manufacturing method thereof; and a camera having an exterior member made of a conductive material such as a metal, and more particularly to a camera in which electric noises can be supplied to a ground pattern of an electric circuit, the noises coming from the outside through the internal mechanism of the camera; and a camera with a lens barrier which is movably arranged on the front surface of a camera body case and functions as a cover of a photographic lens.

Recently, some camera exterior parts each constituting a camera are constructed in such a manner that an exterior member of a camera body, for example, a front cover is made of a metal to add a high quality impression to the camera.

The camera exterior part having the above exterior member made of a metal is manufactured as follows: A front mold member, which serves as an inner frame member and is made of a resin; is attached to the inner surface of a front cover of the camera exterior part by adhesion, and a device arranged in the camera or a rear cover of the exterior member is attached to the front mold member. The front cover is formed using a press work technique. The front mold member is formed using a resin by an injection molding technique.

Recently some cameras are constructed in such a manner that a camera body is covered with an exterior member made of a metal in order to give the impression that the camera has a good appearance and makes a high grade impression on the users. In the case of using a metal as the exterior member, in order to prevent a short circuit between the exterior member and circuit parts or a circuit pattern arranged on a flexible board of the camera body, a part or the whole of the inner surface of the exterior member is subjected to an insulating process or an insulating sheet is adhered to the inner surface thereof.

For the above-mentioned cameras, since the exterior member has conductivity, the camera is charged (or discharged) due to static electricity. In addition, the exterior member functions as an antenna, so that the camera is apt to pick up noises from surroundings. In some cases, the noises cause a current, resulting in adverse effects on electric parts in the camera. Therefore, the exterior member is electrically connected to a ground pattern of an electric circuit of the camera so that the potential of the exterior member is reduced to a ground potential. If the camera picks up noises, a generated current flows through the ground pattern. Thus, the electric parts can be protected.

As a grounding method, for example, one end of a piece of elastic metal is fixed by a screw or the like to a camera body together with a lead wire. The lead wire is connected to the ground pattern of the electric circuit of the camera by soldering. When the exterior member is attached to the camera body, the other end of the metal piece comes into contact with the exposed inner metal surface of the exterior member while being pressed against the surface, thus resulting in an electrical connection.

According to another method, a part of the inner metal surface of the exterior member is exposed and processed such that the exposed portion is partially superimposed on the ground pattern of a printed board of the camera body when the exterior member is attached to the camera body. Upon attachment, the superimposed portion and pattern are tightly fixed using screws, thus grounding the exterior member.

Further, Japanese Unexamined Patent Application Publication No. 11-15054 discloses a technique of realizing electrical connection between an exterior member and a contact on the negative electrode of a battery through a fixing member.

In conventional general cameras, a photographic lens, a finder, and various measurement windows are arranged on the front surface of each camera body. A lens barrier is freely slidably disposed on the front surface of a camera body case. The lens barrier covers the photographic lens, the finder, and the various measurement windows to protect them. Upon photographing, the lens barrier is slid open, thus exposing the photographing lens, the finder, and the measurement windows.

As a camera with a lens barrier as mentioned above, for example, as shown in FIGS. **37** and **38**, a lens barrier **1** molded using a resin is generally used. In the lens barrier **1** made of resin, almost semicylindrical guide rails **1***a* are formed in two portions on each of the surfaces of each of the ends of the lens barrier **1**. The guide rails **1***a* protrude on the surfaces of each end at a predetermined distance from each other. The guide rails **1***a* are freely movably attached to a pair of guides **2***a* provided for a front mold member **2**, which is made of a resin and constitutes a camera body case. Thus, the lens barrier **1** can be stably guided without being influenced by parallelism between the guides **2***a* and the ends of the lens barrier **1**.

Recently some cameras include a metallic exterior serving as the exterior of a camera body case in order to present a high quality impression. For the cameras using such a metal plate, when a barrier-attached camera is formed, it is desired that the lens barrier **1**, freely slidably arranged on the front surface of the camera body case, is also formed using a metal plate.

For conventional barrier-attached cameras, Japanese Unexamined Patent Application Publication No. 1-255839 discloses a camera having the following structure: When a lens barrel is projected, a barrier for protecting a lens is locked through a retaining lever at an open position at the front of a lens in order to prevent the interference between the lens barrel and the barrier. In this camera, the distal end portion of the retaining lever can be in contact with a part of a movable frame of the lens barrel when the lens barrel is projected (projected mode) or while the lens barrel is being projected.

Japanese Unexamined Patent Application Publication No. 6-294991 discloses a barrier-attached camera. In this barrier-attached camera, a barrier includes a locking mechanism for

protecting a lens barrel. The locking mechanism includes a locking member, a contact member, a gear transmission member, and the like. In this camera, in a state in which the lens barrel is located at a projected position where it is possible to photograph, when the barrier is moved in the closing direction, the distal end of the contact member slightly comes into contact with the lens barrel and the locking member comes into contact with a protrusion on a camera body. The locking member is in contact with the camera body, thus protecting the lens barrel against the operating force applied to the barrier.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a camera with a lens barrier for opening and closing the front surface of a lens barrel, the camera having a simple structure in which the operation of the lens barrier does not affect the projecting or retracting operation of the lens barrel.

According to one aspect of the present invention, there is provided a camera having a lens barrier which is movably disposed at the front of a camera body case made of a metal and which can be moved to a closed position, where the front surface of a photographic lens is covered, and to an open position, where the front surface of the photographic lens is exposed, the camera including: the lens barrier formed by working a metal plate; guide rails which are arranged in the camera body case and are in contact with the lens barrier to slidably guide the lens barrier; and protrusions formed on the surface of the lens barrier in the vicinity of the worked end faces of the lens barrier perpendicular to the surface thereof, the protrusions being in contact with the surfaces of the respective guide rails to facilitate sliding of the lens barrier.

Further, according to another aspect of the present invention, there is provided a camera including: a lens barrier which is movable to a closed position, where the front surface of the photographic lens is covered, and to an open position, where the front surface of the photographic lens is exposed, the lens barrier being formed by working a metal plate and having protrusions on the surface thereof in the vicinity of the worked end faces, the protrusions protruding perpendicular to the surface of the lens barrier; and guide rails to which the protrusions of the lens barrier are slidably fitted in order to slidably guide the lens barrier to the closed position, where the photographic lens is covered, and to the open position, where the front surface of the photographic lens is exposed.

Further, according to another aspect of the present invention, there is provided a camera including: a printed wiring board including a pattern portion having a ground potential; a conductive spring in which at least one end serves as an end turn; and a conductive member having conductivity at least on the surface which the other end of the spring is pressed against, wherein the spring holds an exposed portion of the pattern portion at the end turn and presses the other end thereof against the conductive member to realize electrical connection, thus reducing the potential of the conductive member to the ground potential.

Further, according to another aspect of the present invention, there is provided a camera including: a printed wiring board having a pattern portion in which a ground pattern is exposed; a conductive spring in which at least one end is tightly wound; an exterior member made of a metal; and a contact portion which is provided for the exterior member and is brought into contact with the other end of the spring, wherein the spring holds the pattern portion with the tightly-wound end and the electrical connection between the printed wiring board and the exterior member is realized through the spring.

Further according to another aspect of the present invention, there is provided a camera including: a photographic lens barrel having a lens movement path between a photographable position and a non-photographable position where it is impossible to photograph; a barrier having a barrier movement path between a closed position, where the barrier covers the photographic lens barrel, and an open position, where the barrier is withdrawn from the front surface of the photographic lens barrel, the barrier movement path intersecting the lens movement path; and a locking member which is provided for a camera body, which is engaged with the barrier to inhibit the movement of the barrier when the barrier is moved from the open position to the closed position in a state in which the photographic lens barrel is located in the barrier movement path of the barrier, and which continues the engagement so that an operating force applied to the barrier in the closing direction does not affect the movement of the photographic lens barrel when the operating force is continuously applied to the barrier even in a state in which the photographic lens barrel is deviated from the barrier movement path of the barrier.

Other features and advantages of the present invention will be apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a camera exterior part according to a first embodiment of the present invention, the view showing the completion of fixing of the camera exterior part during manufacture;

FIG. **2** is a perspective view showing the completion of the manufacture of the camera exterior part shown in FIG. **1**;

FIG. **3** is an exploded perspective view showing a front cover and a front mold constituting the camera exterior part of FIG. **1**, as observed from the rear;

FIG. **4** is an exploded perspective view showing the front mold and the front mold of the camera exterior part in FIG. **1**, as viewed from the front;

FIG. **5** is a perspective view showing a step of fixing the camera exterior part of FIG. **1**;

FIG. **6** is a sectional view at the line **6**—**6** of FIG. **1**;

FIG. **7** is a sectional view at the line **7**—**7** of FIG. **1**;

FIG. **8** is an exploded perspective view of a modification of the camera exterior part according to the first embodiment shown in FIG. **1**;

FIG. **9** is a perspective view of the completely manufactured camera exterior part of FIG. **8**;

FIG. **10** is a view showing an example of the structure of a camera according to a second embodiment of the present invention;

FIG. **11**A is a perspective view showing the structure of a ground portion for grounding an exterior member of the camera of FIG. **10**;

FIG. **11**B is a sectional view at the line **11**B—**11**B of FIG. **10**, the view showing a state where the ground portion in FIG. **11**A is attached to the camera;

FIG. **12** is a view showing an example of the structure of a ground portion of a camera according to a third embodiment of the present invention;

FIG. **13** is a perspective view showing the front surface of a camera with a lens barrier according to a fourth embodiment of the present invention;

FIG. **14** is a sectional view of an essential part of the camera with the lens barrier shown in FIG. **13**;

FIG. **15** is a plan view of one part of the lens barrier in FIG. **13**, as observed from the rear;

FIG. **16** is a sectional view at the line **16**—**16** of FIG. **15**;

FIG. **17** is a partial sectional view of an essential part of a camera with a lens barrier according to a fifth embodiment of the present invention;

FIG. **18** is a plan view of a part of the lens barrier in FIG. **17**, as observed from the rear;

FIG. **19** is a sectional view at the line **19**—**19** of FIG. **18**;

FIG. **20** is a sectional view at the line **20**—**20** of FIG. **18**;

FIG. **21** is a partial sectional view of an essential part of a camera with a lens barrier according to a sixth embodiment of the present invention;

FIG. **22** is a plan view of a part of the lens barrier in FIG. **21**, as viewed from the rear;

FIG. **23** is a perspective view of a camera with a barrier according to a seventh embodiment of the present invention, the barrier being opened;

FIG. **24** is an exploded perspective view of the camera with the barrier in FIG. **23**, the camera being in a photographing mode and the barrier being detached from the camera;

FIG. **25** is a perspective view of the barrier to be attached to the barrier-attached camera of FIG. **23**, as observed from the inner side opposite to the direction DA in FIG. **23**;

FIG. **26** is a front elevation of the barrier-attached camera of FIG. **23**, as observed in the direction DA in FIG. **23**, the barrier being opened;

FIG. **27** is a front elevation of the barrier-attached camera of FIG. **23**, as observed in the direction DA in FIG. **23**, the barrier being in a semi-open mode;

FIG. **28** is a front elevation of the barrier-attached camera of FIG. **23**, as viewed in the direction DA in FIG. **23**, the barrier being closed;

FIG. **29** is an exploded perspective view of a locking member and components surrounding a lens barrel of the barrier-attached camera of FIG. **23**;

FIG. **30** is a sectional view of the barrier-attached camera of FIG. **23** at the line **30**—**30** of FIG. **23**, the barrier being closed and the lens barrel being in a collapsed position;

FIG. **31** is a sectional view of the barrier-attached camera of FIG. **23** at the line **(31)**—**(31)** of FIG. **23**, the barrier being opened and the lens barrel being in a photographing position;

FIG. **32** is a sectional view of the barrier-attached camera of FIG. **23** at the line **(32)**—**(32)** of FIG. **23**, the barrier being in a semi-open position and the lens barrel being in the photographing position;

FIG. **33** is a sectional view of the barrier-attached camera of FIG. **23** at the line **(33)**—**(33)** in FIG. **23**, the barrier being in the semi-open position and the lens barrel being retracting;

FIG. **34** is a sectional view of the barrier-attached camera of FIG. **23** at the line **(34)**—**(34)** of FIG. **23**, the barrier being in the semi-open position and the lens barrel being retracted in the stored position;

FIG. **35** shows a lens-barrel control unit and primary electrical control circuits of various detection switches of the barrier-attached camera of FIG. **23**;

FIG. **36** is a general flowchart of a photographing process including the lens-barrel control operation interlocked with the opening or closing operation of the barrier in the barrier-attached camera of FIG. **23**;

FIG. **37** is a sectional view of an essential part of a conventional camera with a lens barrier to explain the structure thereof; and

FIG. **38** is a perspective view of a part of the lens barrier in FIG. **37**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will now be described in detail hereinbelow with reference to the drawings.

FIGS. **1** and **2** show a camera exterior part according to a first embodiment of the present invention. FIG. **1** shows a state during fixing and FIG. **2** shows a state in which manufacture is completed.

In other words, a front cover **10** serves as an exterior member. The front cover **10** has a lens-frame-unit accommodation hole **101**, through which a lens frame unit (not shown) is inserted, a flash accommodation hole **102**, an AF-finder-unit accommodation hole **103**, and the like on the front surface thereof. The front cover **10** is made of a metal such as aluminum, stainless steel, magnesium, or titanium and is formed by, for example, a press work technique. As shown in FIGS. **3** and **4**, a pair of guide cut-outs **104** and **105** for barrier attachment is formed at the upper and lower ends of the front cover **10**.

A front mold **11** serving as an inner frame member made of a resin such as polycarbonate or an ABS resin is attached to the inside of the front cover **10**. The front mold **11** is formed using the resin by a well-known injection molding technique. Members constituting respective camera functioning units (not shown) are attached to predetermined portions of the front mold **11**.

The front mold **11** integrally has a frame member **111** which is, for example, substantially rectangular in shape and a band-like reinforcing member **112** which is installed substantially cross-shapedly between the side of the frame member **111** and the opposite side thereof. The front surface of the frame member **111** is shaped into a predetermined form corresponding to the inner surface of the front cover **10**. A pair of barrier guides **113** and **114** (see FIG. **6**) is formed on the upper and lower ends of the frame member **111** so as to correspond to the pair of guide cut-outs **104** and **105** of the front cover **10**.

The reinforcing member **112** has folded portions **115**, folded backward, in the vicinity of, for example, the respective ends of the reinforcing member **112** in order to prevent the inner frame member from warping or deforming, thus holding the flatness to the initial state. The reinforcing member **112** is formed as a runner for supplying a resin in the formation of, for example, the front mold **11** using a resin by the above-mentioned injection molding technique. Resin supply ports are used as band retaining protrusions **116** constituting fixing means for attachment and fixing.

The front mold **11** integrally has a fitting groove **118** and a plurality of elastic retaining portions **119** on the rear thereof. Accordingly, in the front mold **11**, a fitting portion of a rear cover (not shown) is fitted into the fitting groove **118** and the elastic retaining portions **119** are fitted into a retained portion of the rear cover (not shown) with its elasticity. Further, the front mold **11** is attached to the rear cover (not shown) using attachment screws (not shown) which are screwed into hollow posts **117** integrated with the front mold **11**. The rear cover (not shown), the front cover **10**, and the front mold **11** constitute an exterior assembly covering the above camera body (not shown).

A method for manufacturing the camera exterior part which is composed of the front cover **10** and the front mold **11** as mentioned above will now be described.

First, for example, a press work technique is used in a cover manufacturing step. A plate-shaped metal is press worked into a desired shape, thus forming the front cover **10**. In a mold manufacturing step, the front mold **11** is formed using a resin by the injection molding technique so as to have in a unified piece the frame member **111**, the reinforcing member **112**, the barrier guides **113** and **114**, the posts **117** for receiving attachment screws, the fitting groove **118**, and the elastic retaining portions **119**. The reinforcing member **112** prevents the front mold **11** formed using the resin from warping or deforming after the formation, thus retaining the flatness of the formation.

Subsequently, in a fixing step, an adhesive is applied to the inner surface of the front cover **10**. Then, the outer surface of the front mold **11** is brought into contact with the inner surface of the front cover **10**. Thus, the front mold **11** is attached to the inside of the front cover **10**. In this state, band members **12** are wound around the front cover **10** and the front mold **11** as shown in, for example, FIG. **5**. The ends of the band members **12** are retained by the respective band retaining protrusions **116** of the reinforcing member **112** of the front mold **11**. In this instance, the front cover **10** and the front mold **11** are left as they are connected with pressure by the band members **12** until the adhesive cures. Upon curing of the adhesive, the reinforcing member **112** prevents the front mold **11** from warping or deforming to maintain the initial flatness.

Then, the adhesive cures to fix the front mold **11** to the front cover **10**. In this state, the band members **12** are first detached from the band retaining protrusions **116** of the reinforcing member **112**. As shown in FIG. **1**, the front mold **11** integrated with the reinforcing member **112** is fixed to the inner surface of the front cover **10** by adhesion.

As shown in FIGS. **6** and **7**, the reinforcing member **112** protrudes backward in the front mold **11**. For instance, in a step of attaching the front mold **11** to the camera body (not shown), the reinforcing member **112** is cut using a cutting tool such as a nipper and is then removed from the front mold **11**, leaving the front mold and camera body as shown in FIG. **2**.

After that, the camera body (not shown) and the rear cover (not shown) are attached to the rear of the part composed of the front cover **10** and the front mold **11**. A barrier (not shown) is disposed at the front surface of the front cover **10** so that both ends of the barrier are freely slidably fitted to the barrier guides **113** and **114** of the front mold **11** through the guide cut-outs **104** and **105**, respectively. The barrier (not shown) is guided through the guide rails **113** and **114** of the front mold **11** and is moved between a closed position, where the barrier covers the foregoing lens frame unit (not shown) inserted through the lens-frame-unit accommodation hole **101** on the front surface of the front cover **10**, and a photographing position where the lens frame unit (not shown) is exposed so that it is possible to photograph.

As mentioned above, the camera exterior part is constructed in such a manner that the front mold **11** integrated with the reinforcing member **112** for preventing the deformation is injection-molded using a resin, the front mold **11** is fixed to the inner surface of the front cover **10** made of a metal by adhesion, and after the fixing, the reinforcing member **112** is cut and removed from the front mold **11**.

According to this, with the front mold **11** being restrained from warping or deforming by the reinforcing member **112**, the front mold **11** is adhered to the front cover **10**. Thus, stable fixing is realized with high accuracy. After the fixing, the reinforcing member **112** is cut and removed. Therefore, a strong arrangement for fixing and reinforcement is realized without restricting the structure of the exterior part. Consequently, high-quality assembly of the front mold **11** and the front cover **10** is realized, resulting in the simple and easy assembly of the exterior part with high accuracy.

According to the method for manufacturing the camera exterior part, the front mold **12** integrated with the reinforcing member **112** for preventing the deformation is injection-molded using a resin, the front mold **11** is fixed to the inner surface of the front cover **10** made of a metal by adhesion, and after the fixing, the reinforcing member **112** is cut and removed from the front mold **11**.

According to this, the reinforcing member **112** restrains the front mold **11** from warping or deforming. In the fixing step, with the desired flatness being retained until the adhesive cures, the front mold **11** is adhered to the front cover **10**, thus realizing stable fixing with high accuracy. Since the reinforcing member **112** is cut and removed after the fixing, the strong arrangement for fixing and reinforcement can be realized without restricting the structure of the exterior part. Consequently, high-quality assembly of the front mold **11** and the front cover **10** is realized, resulting in the simple and easy assembly of the exterior part with high accuracy.

The above-mentioned embodiment has been described with a case where the reinforcing member **112** is realized using the runner upon injection molding. The structure is not limited to this. In addition to this, the frame member **111** may also be integrated with the reinforcing member **112** which is another thing obtained from the runner.

The present invention is not limited to the above embodiment. According to a modification of the first embodiment, a front mold **13** can be formed in a shape as shown in FIGS. **8** and **9** using a resin. In FIGS. **8** and **9**, the same components as those in FIGS. **1** to **7** are designated by the same reference numerals to omit the detailed description.

According to the modification in FIGS. **8** and **9**, the front mold **13** has a reinforcing member **131** formed as one piece with the front mold **13** so as to close the front surface of the metallic front cover **10**. The front mold **13** will be attached and fixed to the substantially curved front surface of the front cover **10**. A plurality of holes **132** such as perforations are punched at regular intervals around the reinforcing member **131** of the front mold **13**.

The reinforcing member **131** is formed so as to close the lens-frame-unit accommodation hole **101** of the front cover **10** in a state in which the front mold **13** is attached to the inside of the front cover **10**.

In the above arrangement, the front mold **13** is formed so as to have in one piece the reinforcing member **131** to be cut and the perforations **132** using a resin by the well-known injection molding technique whereby these members are contiguously integrated. Since the front mold **13** formed using the resin is integrated with the reinforcing member **131**, the operation of the reinforcing member restrains the front mold **13** from warping or deforming to retain desired flatness.

In a fixing step, an adhesive is first applied to the periphery (corresponding to a portion excluding the reinforcing member **131** of the front mold **13**) of the inner surface of the front cover **10** and the outer surface of the front mold **13** is come into contact with the inner surface of the front cover **10**. Thus, the front mold **13** is attached to the front cover **10**.

In this state, the foregoing band members **12** (refer to FIG. **5** because they are not shown in FIGS. **8** and **9** in views of circumstances of the drawings) are wound around the front cover **10** and the front mold **13** and are left until the adhesive cures. Upon curing of the adhesive, the reinforcing member **131** prevents the front mold **13** from warping or deforming, thus retaining the initial flatness.

After that, in this state in which the adhesive cures to fix the front cover **10** to the front mold **13**, the band members **12** are first detached and removed. In this instance, a shock is given in the direction from the front surface to backward of the reinforcing member **131** through the lens-frame-unit accommodation hole **101** of the front cover **10**. Thus, the reinforcing member **131** is cut along the perforations **132** and is removed from the front surface of the front mold **13**. Accordingly, the lens-frame-unit accommodation hole **101** of the front cover **10** is exposed at the rear of the front mold **13**, thus preparing for the attachment to the camera body (not shown) as mentioned above.

The above-mentioned modification in FIGS. **8** and **9** has been described with a case where the front mold **13** is formed with the reinforcing member **131** surrounded by the perforations **132** formed at regular intervals and the reinforcing member **131** is cut and removed along the perforations **132**. The arrangement is not limited to this case. Instead of the perforations, reinforcing ribs are arranged at predetermined intervals around the reinforcing member. The reinforcing member can also be cut and removed from the front mold so as to be punched using the reinforcing ribs.

Further, the above-mentioned embodiment and modification have been described with the case where the exterior part is applied to the front cover. The present invention is not limited to this case. The exterior part can also be applied to the rear cover. Similar advantages are expected.

The foregoing embodiment and modification have been described with the case where the front cover **10** is formed by press work. Working is not limited to this case. The front cover may be formed using various working techniques such as injection molding and the like.

Accordingly, the present invention is not limited to the above-mentioned embodiment and modification. In addition, other various modifications are possible without departing from the spirit of the invention in embodying stages. Further, since the foregoing embodiment and modification include various stages of the invention, various inventions may be obtained by the appropriate combinations of disclosed components.

For example, if some components are eliminated from all the components disclosed in the embodiment and the modification, the arrangement excluding the eliminated components may be included in the present invention so long as the disadvantages, described in the paragraph regarding the problems that the present invention is to solve, can be overcome and advantages, which will be described in a paragraph regarding advantages of the invention, are obtained.

As described above in detail, according to the first embodiment and the modification thereof, the camera exterior part which can simply and easily realize high-accurate assembly with a simple construction and the method for manufacturing the same can be provided.

FIG. **10** shows an example of the structure of a camera according to a second embodiment of the present invention.

This camera is constructed in such a manner that the front of a camera body **201** is covered with an exterior member **202**.

The whole of the exterior member **202** is made of a conductive material such as metal. Aluminum is anodized or an insulating sheet is adhered to the inner surface of the exterior member **202** in order to prevent a short circuit in circuit parts or a circuit pattern mounted on a flexible board (printed wiring board) of the camera body. Thus, the inner surface of the exterior member **202** exhibits insulating properties. According to the present embodiment, the exterior member **202** is shaped into a box covering the front surface (the side of the photographic lens), the upper and lower surfaces, and both the side surfaces of a camera, except for the rear surface (the side of a rear cover). A photographic-lens opening **203** through which a lens barrel is inserted, a finder window **204**, a distance-measuring and photometric window **205**, and a flash window **206** are formed in the exterior member **202**. A release button **207** is arranged on the upper surface of the exterior member **202**. It is a matter of course that the exterior member **202** is not limited to the box type. Other windows may be formed as necessary.

In the camera body **201**, the following are arranged: a lens barrel **208** at the center of the front surface thereof, spool chamber **210** including a spool shaft **209** for taking up a film on the right as viewed from the front of the camera, and cartridge chamber (not shown) for loading a film cartridge on the left as viewed in the same manner. A finder and distance-measuring and photometric unit **211** are disposed in the upper portion of the camera body. A main flexible board **212** is disposed above the unit **211** so as to cover the left of the front surface of the camera body. The main flexible board **212** includes an electric circuit for controlling various components of the camera and performing the arithmetic operation. The front surface of the main flexible board **212** is folded along a side adjacent to the lens barrel **208**. A main control unit (CPU) **213** for performing controls and computations and an interface IC (IFIC) **214** for transmitting and receiving signals to/from the respective components are arranged in the folded portion of the board **212**. A V-shaped notch **212***a* through which a ground spring is attached is formed at the upper end of the front surface of the main flexible board **212**. The notch **212***a* includes a ground portion in which a ground spring **215** is inserted.

FIG. **11**A is a perspective view of the structure of the ground portion for grounding the exterior member. FIG. **11**B is a sectional view at the line **11**B—**11**B of FIG. **10** and shows the details of the ground portion attached to the camera.

The V-shaped notch **212***a* is formed at the upper end of the front surface of the main flexible board **212**. The notch **212***a* functions to restrict the movement of the spring **215** in the direction X shown in FIG. **11**A. The side portions of the notch restrict the movement of the spring **215**. Accordingly, the shape is not limited to the shape of a letter V. A U-shaped notch, a semicircular notch, or a rectangular notch can be used. The shape of the notch is appropriately set depending on the depth of cut and the designing conditions of the camera. In other words, although the spring **215** has to be positioned within a range where the spring **215** is in contact with a ground pattern **212***b*, it is unnecessary to accurately position the spring **215**. Accordingly, in consideration of the size of the ground pattern **212***b*, the shape of the notch can be appropriately changed such that even when the spring **215** moves, the spring **215** can maintain contact with the ground pattern **212***b*.

The circular ground pattern **212***b* is formed on the main flexible board **212** so as to overlap partially the lower portion of the notch **212***a*. A positioning hole **212***c* is formed on the

ground pattern **212***b* or in the vicinity thereof. An insulation coating on the surface of the ground pattern **212***b* is eliminated and the surface of the ground pattern **212***b* is exposed.

As shown in FIG. **11**B, the ground spring **215** is, for example, a coil spring that is conical in shape. The spring **215** is wound so that when the spring **215** is compressed, respective winding segments do not overlap with each other. One end **215***a* of an end turn **215***c* on the bottom of the conical spring is folded and inserted into the positioning hole **212***c* of the notch **212***a* formed on the main flexible board **212**.

When the spring **215** is inserted to the notch **212***a*, the end **215***a* is inserted into the positioning hole **212***c*, thus positioning the spring **215**. The end turn **215***c* elastically holds the ground pattern **212***b* which is on the main flexible board **212**, thus accomplishing the electrical connection between the spring **215** and the ground pattern **212***b*. In this instance, if the end **215***a* is merely inserted into the positioning hole **212***c*, the spring **215** may rotate around the end **215***a*. However, since the above-mentioned notch **212***a* restricts the movement of the spring **215** in the direction X, the spring **215** is not deviated from the ground pattern **212***b*.

The end turn **215***c* is formed by tightly winding. Accordingly, only the insertion of the end turn **215***c* of the spring **215** allows the end turn **215***c* to elastically hold the ground pattern **212***b*, resulting in a simple assembly. On the other hand, in the exterior member **202**, a portion of an insulating sheet **216** is eliminated in a position opposite to the spring **215**. A conductive portion **202***a* serving as the metallic surface of the exterior member **202** is thus exposed.

Therefore, when the exterior member **202** is attached to the camera body **201**, the spring **215** is compressed as shown in solid-line fashion in FIG. **11**B. An upper (i.e. narrow end) portion **215***b* of the spring **215** comes into contact with the conductive portion **202***a* on the inner surface of the exterior member **202** due to pressure of the spring **215**, resulting in the electrical connection between the exterior member **202** and the ground pattern in the main flexible board **212**. In the conducting state, the potential of the exterior member **202** is maintained at the potential of the ground pattern, namely, the ground potential.

As mentioned above, according to the present embodiment, the camera exterior member made of a conductive material is attached to the camera body, resulting in the electrical connection between the exterior member and the ground pattern of the printed wiring board of the camera body through the conductive coil spring. Consequently, a current caused by noises surrounding the camera or charges caused by static electricity can be supplied from the exterior member to the ground pattern of the electric circuit, thus preventing adverse effects on electric parts of the camera.

A third embodiment of the present invention will now be described.

FIG. **12** shows an example of the structure of a ground portion according to the third embodiment. According to the third embodiment, the ground portion differs from that of the foregoing second embodiment. Since the other components are the same as those of the second embodiment, the description regarding the common components is omitted.

According to the foregoing second embodiment, the positioning hole **212***c* is formed on the ground pattern **212***b* or in the vicinity thereof in the main flexible board **212**. According to the present embodiment, in order to increase the area of the ground pattern **212***b*, the ground pattern **212***b* is formed such that the lower portion (bottom) of the notch **212***a* substantially serves as the center of the pattern. Except that the end **215***a* of the spring **215** is not folded, the same spring **215** as that of the second embodiment is used. The spring **215** is arranged in the fold of the main flexible board **212** and the end turn **215***c* is inserted to the lower portion of the notch **212***a*.

According to the third embodiment, the ground pattern **212***b* is formed in a range where the position of the spring **215** is restricted due to the notch **212***a* formed in the main flexible board **212**. Accordingly, it is unnecessary to arrange the end turn **215***c* by folding the spring **215**. Thus, the shape of the part can be simplified and the assembly is easily accomplished.

The foregoing second and third embodiments have been described with the case where the entire exterior member is made of an electric conductor such as metal. The exterior member is not limited to this case. An exterior part having the following structure can also be used: A metal plate is drawn to form a metallic cover serving as a part or the whole of the exterior of a camera and a cover made of a resin by molding is then integrally fixed to the inner surface of the cover. Protrusions and attachment portions such as tapped holes for attaching various operating members of the camera body are formed on the inner surface of the resin cover. When the exterior part is attached to the camera body, a portion of the resin cover which is in contact with the upper portion **215***b* of the coil spring **215** is eliminated, thus exposing the metal surface.

Further, according to the present embodiment, the conical spring is used for electrical connection between the exterior member and the ground pattern. In addition to this, a cylindrical coil spring (including tight winding) or a thin plate spring can also be used so long as the spring is formed so as to elastically hold the ground pattern by a tightly wound portion thereof. Means for electrical connection is not limited to the spring. For example, a metal clip having a shape such that one end thereof is folded can also be used.

According to the above-mentioned second and third embodiments, the ground portion is arranged on the front surface of the camera. The position is not limited to this case. The ground portion can also be arranged on the main flexible board on the upper surface of the camera. When the ground portion is so arranged, an operation switch provided for the exterior member can be used. In addition, the ground portion can also be arranged in the vicinity of an operation switch provided for the camera body or an opening for the lens barrel. For instance, if a release button (release switch) provided for the upper surface of the exterior member is cylindrical, a cylindrical coil spring is fitted about the periphery of the release button. On the main flexible board, a ground pattern is formed in a portion in the vicinity of the arrangement of the release button so that the pattern is in contact with the end of the cylindrical coil spring when the exterior member is attached to the camera body. Thus, advantages similar to the above embodiments can be derived.

According to the foregoing second and third embodiments, the notch and the positioning hole are formed to restrict the position of the spring **215**. In order to eliminate these components to simplify the shape of the part, an adhesive tape can be used to fix the spring. Alternatively, the force of the spring can be increased, thus preventing the movement of the spring.

As described above in detail, the second and third embodiments of the present invention can provide a camera in which a predetermined conductive exterior member can surely be grounded with a simple arrangement without increasing the number of components.

FIG. **13** shows an essential part of a camera with a lens barrier according to a fourth embodiment of the present invention. In the camera with the lens barrier, a front cover **330** on the front surface of the camera constitutes a camera body case. The front cover **330** is formed using a metal plate made of aluminum, stainless steel, magnesium, or titanium and is formed by, for example, the press work technique. A front mold member (hereinbelow, referred to as a front mold) **331**, which is a frame made of a resin, is adhered and attached to a predetermined position of the inner surface of the front cover **330**.

A lens-frame-unit accommodation hole **301** through which a photographic lens is arranged is formed at the center of the front surface of the front cover **330**. An AF-finder-unit accommodation hole **302** and a flash-unit accommodation hole **303** are formed side by side above the lens-frame-unit accommodation hole **301**. Further, a slot **304** and a notch **305**, which function as a pair of guide rails, are formed so as to have a predetermined length in the directions shown by arrows SA and SB (the directions of movement) at the upper portion and the lower edge of the front surface of the front cover **330**.

Alternatively, a pair of rails **311** (the lower rail is not shown in views of circumstances of the drawing) are separately formed substantially parallel to each other on the upper and lower portions of the front surface of the front mold **331**. When the front mold **331** is attached to the inner surface of the front cover **330**, these rails **311** are accommodated and arranged in the slot **304** and the notch **305** of the front cover **330**.

Elastic retaining nails **313** and fitting recesses **314** (refer to FIG. **14**) are formed on the rear of the front mold **331**. Each fitting recess **314** is fitted to the corresponding fitting protrusion of a rear cover (not shown) which covers the rear of the camera and serves as the camera body case. The elastic engaging nails **313** are elastically engaged with respective predetermined portions of the rear cover (not shown). Accordingly, the front mold **331** is attached to the rear cover (not shown) while holding the camera body (not shown) therein, the front mold **331** being detachable therefrom.

A lens barrier **332** is freely slidably arranged at the front surface of the front cover **330** in the directions shown by the arrows SA and SB so as to cover the lens-frame-unit accommodation hole **301**. The lens barrier **332** is formed using a metal plate made of aluminum, stainless steel, magnesium, or titanium by, for example, the press work technique.

A closing portion **321** is formed at substantially the center of the lens barrier **332** so as to close the lens-frame-unit accommodation hole **301** and the AF-finder-unit accommodation hole **302** of the front cover **330**. A pair of folded sliding portions **322** is formed on the upper and lower edges of the closing portion **321** so that the portions **322** can be received in the pair of rails **311** of the front mold **331**.

Each sliding portion **322** has a plurality of, e.g., two protrusions **324** which are almost hemispherical as shown in FIGS. **14** and **16**. The protrusions **324** project in the vicinity of the end face of each sliding portion **322** perpendicular to the surface of the sliding portion **322**. The protrusions **324** are formed so as to be higher than a burr **333** and so as to correspond to the direction of generation of the burr **333**, which may occur at the edge of the lens barrier **332** when the lens barrier **332** is cut in the press work step. In addition, curved projections **325** (see FIG. **15**) are formed on the end face of each sliding portion **322** of the lens barrier **332** so as to correspond to the protrusions **324**. The curved projections **325** are freely movably come into contact with the bottom surface of the corresponding rail **311**.

When the lens barrier **332** is moved in the direction shown by the arrow SA or SB, various switches such as a power switch and similar components (not shown) which are arranged on, for example, the front cover **330**, are turned on or off at a position to which the lens barrier **332** is moved. At an open position where the lens-frame-unit accommodation hole **301** and the AF-finder-unit accommodation hole **302** of the front cover **330** are exposed to expose the surface of a photographic lens (not shown), a camera function is allowed to enter a photographing standby mode. At a closed position, a power supply is turned off.

In the above arrangement, the front mold **331** is attached to the inner surface of the front cover **330** in such a manner that the through hole **304** and the notch **305** are made to correspond to the respective rails **311** of the front mold **331** and they are adhered to each other using an adhesive.

In this state, for example, the sliding portion **322** on the upper portion of the lens barrier **332** is inserted into the slot **304** of the front cover **330** and is then freely movably received in the rail **311** on the upper portion of the front mold **331**. Subsequently, the sliding portion **322** on the lower portion of the lens barrier **332** is inserted through the notch **305** of the front cover **330** and is then freely movably received in the rail **311** on the lower portion of the front mold **331**.

In this instance, the protrusions **323** of the upper and lower sliding portions **322** of the lens barrier **332** are brought into contact with the sliding surfaces of the side walls of the respective rails **311** of the front mold **331**. Simultaneously, the round projections **325** are brought into contact with the respective bottom surfaces of the rails **311**. Consequently, while the burr **333** formed at the edge of each sliding portion **322** is prevented from being in contact with the sliding surface as the side wall of the rail **311**, the lens barrier **332** is freely movably attached to the front surface of the front cover **330** in the directions shown by the arrows SA or SB.

When the lens barrier **332** is moved in the direction shown by the arrow SA, the curved projections **325** of the respective sliding portions **322** are guided by the bottom surfaces of the rails **311** of the front mold **331** and the projections **324** are guided by the sliding surfaces as the side walls of the rails **311** of the front mold **331**. Consequently, the lens barrier **332** is moved to the closed position where the lens-frame-unit accommodation hole **301** and the AF-finder-unit accommodation hole **302** of the front cover **330** are covered. In this instance, the front surface of the photographic lens (not shown) disposed through the lens-barrel-unit accommodation hole **301** is covered with the closing portion **321** of the lens barrier **332**.

When the lens barrier **332** is moved from the closed position in the direction shown by the arrow SB, similarly, the curved projections **325** of the respective sliding portions **322** are guided to the bottom surfaces of the rails **311** of the front mold **331** and the respective projections **324** are guided to the sliding surfaces of the rails **311** of the front mold **331**. Consequently, the lens barrier **332** is moved to the open position where the lens-barrel-unit accommodation hole **301** and the AF-finder-unit accommodation hole **302** of the front cover **330** are exposed. In this instance, the front surface of the photographic lens (not shown) disposed through the lens-barrel-unit accommodation hole **301** is exposed. Thus, it is in a photographable mode.

As mentioned above, the camera with the lens barrier is constructed as follows: The protrusions **324** are formed in the vicinity of the end face of each sliding portion **322** of the

lens barrier **332**, which is made of a metal plate and is freely movably attached to the front surface of the front cover **330** between the closed position where the front surface of the photographic lens is covered and the open position where the front surface of the photographic lens is exposed, the protrusions **324** projecting outwardly further than the burr **333** formed at the edge perpendicular to the surface of the lens barrier **332**. When the lens barrier **332** is moved along the rails **311**, the protrusions **324** of the sliding portions **322** are moved in contact with the sliding surfaces of the respective rails **311** of the front mold **331**.

Accordingly, when the lens barrier **332** is slid along rails **311**, the protrusions **324** are guided and slid while being in contact with the surfaces of the rails **311**. Thus, the edges of the end faces of the lens barrier **332** are not in contact with the surfaces of the rails **311** and the lens barrier **332** is moved. Therefore, in the manufacture of the lens barrier **332** using a metal plate, the edges of the end faces of the sliding portions **322** formed on the upper and lower ends of the lens barrier **332** need not to be especially worked. The stable moving operation can be accomplished and the simple manufacture can be realized.

The present invention is not limited to the above embodiments. In addition to this, an arrangement as shown in FIGS. **17** to **20** and an arrangement as shown in FIGS. **21** and **22** are possible. In FIGS. **17** to **22**, the same components as those in FIGS. **13** to **16** are designated using the same reference numerals to omit the detailed description regarding the components.

In other words, according to a fifth embodiment shown in FIGS. **17** to **20**, on each of both surfaces of each of the upper and lower sliding portions **322** of the lens barrier **332**, two first protrusions **340** and two second protrusions **341** protruding in opposite directions (only the upper portion is shown in views of circumstances of the drawings) are formed at predetermined intervals. Accordingly, when the lens barrier **332** is moved on the rails **311** of the front mold **331**, the first and second protrusions **340** and **341** can prevent the burrs generated upon forming the lens barrier **332** and the edges of the sliding portions **322** from being in contact with the inner walls of the rails **311**.

According to a sixth embodiment shown in FIGS. **21** and **22**, substantially hemispherical protrusions **342**, made of a resin, are formed in the vicinity of the end faces of the upper and lower sliding portions **322** of the lens barrier **332** (only the upper portion is shown in views of circumstances of the drawings) so as to protrude perpendicular to the surface of the sliding portions **322**. In this case, the protrusions **342** are formed on the sliding portions **322** of the lens barrier **332** by pressing. Alternatively, the protrusions **342** are arranged on the sliding portions **322** by adhesion. According to the present embodiment, the protrusions **342** can also be arranged perpendicular to the surfaces of each sliding portion **322** in opposite directions in the same way as the foregoing embodiment described with reference to FIGS. **17** to **20**.

The above fourth, fifth, and sixth embodiments have been described with the case where the protrusions **324**, **340**, **341**, and **342** are formed to be substantially hemisphere-shaped. The shape is not limited to this case. In addition to this, various shapes such as polygons can be used.

Furthermore, the above embodiments have been described with the case where the round projections **325** are formed at the end face of each of the sliding portions **322** of the lens barrier **332** and the round projections **325** are slid on the bottom surface of each of the rails **311**. The arrangement is not limited to this case. An arrangement having no round projection **325** can also be realized.

The above embodiments have been described with the case where the present invention is applied to the case component which is composed of the front cover **330** and the front mold **331**, the front mold **331** being attached to the inner surface of the front cover **330**. The present invention is not limited to the case component and other arrangements can be realized.

Accordingly, the present invention is not limited to the above fourth to sixth embodiments. In addition to these, various modifications are possible without departing from the spirit of the invention in embodying stages. Further, since the above embodiments include various stages of the invention, various inventions may be obtained by the appropriate combinations of the disclosed components.

For example, if some components are eliminated from all the components disclosed in the above embodiments, the arrangement excluding the eliminated components may be included in the present invention so long as the disadvantages, described in the paragraph regarding the problems that the present invention is to solve, can be overcome and advantages, which will be described in a paragraph regarding advantages of the invention, are obtained.

As described in detail, according to the foregoing fourth, fifth, and sixth embodiments, it is possible to provide a camera with a lens barrier which can be easily and simply manufactured with high quality without performing edge processing.

FIG. **23** is a perspective view of a camera having a lens barrier (hereinbelow, referred to as a barrier) according to a seventh embodiment of the present invention, the barrier being opened. FIG. **24** is an exploded perspective view of the camera from which the barrier is detached and which is in a photographable mode. FIG. **25** is a perspective view of the barrier to be attached to the camera as viewed from the inside and in the direction opposite to the direction DA of FIG. **23**. FIGS. **26** to **28** are front views showing the opening and closing mode of the barrier as viewed from the direction DA in FIG. **23**. FIG. **26** shows the barrier opening mode. FIG. **27** shows the barrier semi-opening mode. FIG. **28** shows the barrier closing mode.

In the following description, it is assumed that a subject side of the camera is set to a front side and an image formation side is set to a rear side. It is also assumed that the direction of movement of the barrier toward the closed position is set to the direction SA and the direction of movement toward the open position is set to the direction SB.

According to the present embodiment, as shown in FIG. **23**, the barrier-attached camera comprises a barrier **402** capable of moving between a closed position P2A (FIG. **28**), where the front surface of a photographic lens in a stored position on the front surface of a camera body **401** is covered, and an open position P2B (FIG. **26**), where the front surface of the photographic lens in a photographing position is exposed, through a semi-open position P2C (FIG. **27**) where the barrier is locked.

A photographic lens barrel (hereinbelow, referred to as a lens barrel) **403** is driven forward and backward between a collapsed position serving as a non-photographable position and the photographing position serving as a photographable position, together with the opening and closing operations of the barrier **402** operating under the control of the lens barrel.

The path of movement of the photographic lens barrel **403** between the photographing position and the stored position is set to a lens movement path. The path of movement of the

barrier **402** between the closed position and the open position is set to a barrier movement path.

The barrier movement path intersects the lens movement path. When the lens barrel **403** is located in the stored position, the lens barrel **403** is deviated from the barrier movement path. When the photographic lens barrel **403** is located in the photographing position, the lens barrel **403** is positioned on the barrier movement path. In other words, when the barrier **402** is located in the open position, the barrier **402** is deviated from the lens movement path of the photographic lens barrel **403**. When the barrier **402** is located in the closed position, the barrier **402** is positioned on the lens movement path of the photographic lens barrel **403**.

In the camera according to the present embodiment, on the upper and lower portions of the front surface of the camera body **401** also serving as an exterior part as shown in FIGS. **23** and **24**, guide grooves **401***a* and **401***b* for slidably supporting the barrier **402** are formed in parallel to each other so as to extend in the lateral direction.

The lens barrel **403** is arranged at the center of the front surface of the camera body **401**. The lens barrel **403** is freely movable forward and backward along an optical axis O. A flash window **404**, a finder window **405**, a distance-measurement receiving window **406**, a distance-measurement projecting window **408**, a photometric window **407**, and a self-timer indication window **409** are arranged at the upper portion of the camera above lens barrel **403**. When the barrier **402** is located in the closed position P2A (FIG. **28**), the received lens barrel and the windows from the distance-measurement receiving window **406** to the self-timer indication window **409** are completely covered.

A release button **410** for operating a release switch **410***a* (refer to FIG. **35**) is disposed on the upper surface of the camera body **401**.

As shown in FIG. **24**, a locking shaft **418** of a locking member is arranged on the left of the lens barrel **403** on the front surface of the camera body **401**, the distal end of the locking shaft **418** being retractable. A barrier detection switch **401***c* comprising contacts **401***d* and **401***e* to detect the opening or closing state of the barrier **402** is arranged below the locking shaft **418**. A small hole **401***h* is formed on the upper portion of the front surface of the camera body **401**. A click spring **401***n* and a click ball **401***m* which perform the click-stop operation to the barrier **402** are fitted in the small hole **401***h*.

As shown in FIG. **25**, in the barrier **402**, engaging guides **402***a* and **402***b* are formed at the upper and lower flanged edges thereof. An engagement hole **402***c* and a protrusion **402***d* are arranged on an inner surface **402***e* in the vicinity of the end face in the closing direction of the barrier **402***f*. Two click recesses **402***i* and **402***j* are formed on the inner surface of the upper flanged edge.

The guides **402***a* and **402***b* are freely slidably fitted in the guide grooves **401***a* and **401***b* of the camera body **401**, respectively. The protrusion **402***d* functions to press the contact **401***e* of the barrier detection switch **401***c* arranged on the camera body **401**.

When the barrier **402** is in the open position P2B, the protrusion **402***d* presses the contact **401***e* and allows the contact **401***e* to come into contact with the contact **401***d*, thus turning the barrier detection switch **401***c* on. Due to an ON signal of the switch **401***c*, projecting the lens barrel **403** to the photographable position is started. When the barrier **402** is moved from the open position P2B to the semi-open position P2C, the contact **401***e* is released to turn the barrier detection switch **401***c* off (refer to FIGS. **27** and **32**). Due to an OFF signal of the switch **401***c*, retracting the lens barrel **403** is started. The barrier detection switch **401***c* is always covered with the barrier **402** and is never exposed irrespective of whether the barrier **402** is open or closed.

The click ball **401***m*, fitted in the small hole **401***h* on the upper portion of the camera body **401**, falls into the click recess **402***i* or **402***j* and clicks, thus stopping the barrier **402** at a predetermined position. In other words, when the ball **401***m* is fitted into the click recess **402***i*, the barrier **402** is click-held at the open position P2B. When the ball **401***m* is fitted into the click recess **402***j*, the barrier **402** is click-held at the closed position P2A.

The engagement hole **402***c* is not a through-hole and has a bottom. The end of the locking shaft **418** projected from the camera body **401** can be fitted into the engagement hole **402***c*. In the state in which the lens barrel **403** is in the photographing state, when the barrier **402** is slightly moved form the open position P2B in the direction SA, the distal end of the locking shaft **418** projected and pressed is fitted into the engagement hole **402***c*. The position of the barrier **402** where the locking shaft **418** is fitted into the engagement hole **402***c* is the semi-open position P2C. The locking shaft **418** inhibits the barrier **402** from further moving in the direction SA, thus preventing the end face **402***f* of the barrier **402** from coming into contact with the periphery of the lens barrel **403**.

The driving mechanism of the lens barrel **403** and the locking mechanism of the locking shaft **418** and surroundings will now be described in detail with reference to FIGS. **29** and **30**. FIG. **29** is an exploded perspective view of the locking shaft, the lens barrel, and surroundings. FIG. **30** is a longitudinal sectional view of the camera in the respective operating states.

The lens barrel **403** comprises a zoom frame **403***f* and a movable frame **403***a* for movably holding the zoom ring **403***f*.

The lens barrel **403** is fitted in an opening **401***j* of the camera body **401** and is freely slidably supported along a guide shaft **415**, which is supported by the camera body **401** and is parallel to the photographic-lens optical axis O. The lens barrel **403** is driven forward and backward by a feed screw **413** arranged in parallel with the guide shaft **415**. When the lens barrel **403** is retracted to the stored position in the camera body **401**, a flange **403***b* of the lens barrel **403** comes into contact with a protrusion **422***a* of an aperture member **422** fixed to the camera body **401** upon collapsing the lens barrel. A pressure plate **423** and a pressure-plate spring **424** are disposed between the aperture member **422** and a rear cover **401***k* (FIG. **30**).

The feed screw **413** is fitted into a screw hole **403***c* formed on the flange **403***b* of the movable frame **403***a* so as to be rotatably supported between the aperture member **422** and the camera body **401**. A gear **414** engaged with a pinion **412** of a drive motor **411** is fixed to one end of the feed screw **413**. The guide shaft **415** is supported between the aperture member **422** and the camera body **401** and is slidably fitted in a guide hole **403***d* of the movable frame **403***a*. Accordingly, when the drive motor **411** rotates, the feed screw **413** rotates, so that the movable frame **403***a* of the lens barrel **403** is driven forward or backward along the guide shaft **415**. A slit plate **416** is fixed to an output shaft of the drive motor **411**. A photo-interrupter **417** detects the amount of rotation of the slit plate **416**. An output signal of the photo-interrupter **417** is supplied to a CPU **432**, which will be described later (see FIG. **35**).

A shaft supporting base **403***h* for slidably supporting the locking shaft **418** and a pressure spring **403***g* comprising a

plate spring for pressing and driving the locking shaft **418** are arranged on the side of the movable frame **403***a*.

The locking shaft **418** is a locking member comprising a long stick-like member as shown in FIGS. **29** and **30**. The locking shaft **418** is freely slidably supported in parallel to the optical axis O by a supporting hole **403***i* of the shaft supporting base **403***h* on the movable frame **403***a* and a side supporting hole **401***i* of the camera body **401**. A stopper **418***b* is attached to the locking shaft **418**. The stopper **418***b* is fitted in a groove **418***a* arranged at a predetermined position forward from the shaft supporting base **403***h*. A return spring **419** serving as a pressing member comprising a compression spring is arranged between the stopper **418***b* of the locking shaft **418** and the supporting hole **401***i* of the camera body **401**. The return spring **419** surrounds shaft **418** and presses the locking shaft **418** backward (in the direction in which the locking shaft **418** is not engaged with, i.e. is separated from, the barrier **402**).

The distal end of the pressure spring **403***g* arranged on the movable frame **403***a* comes into contact with the stopper **418***b* of the locking shaft **418** depending on the position of the movable frame **403***a* which is projected or retracted. The contact permits the locking shaft **418** to move forward. The control pressing force of the pressure spring **403***g* is set to be larger than the pressing force of the return spring **419** in the predetermined relative positioning range between the movable frame **403***a* and the locking shaft **418**.

A slide contact **420** comprising a contact **420***a* and a common contact **420***b* is attached on the lower surface of the shaft supporting base **403***h*. The slide contact **420** moves along the optical axis O with the forward or backward movement of the movable frame **403***a*. A lens-barrel-position detection switch board **421** to be brought into contact with the slide contact **420** is arranged on the bottom of the camera body **401** under the slide contact **420**.

The lens-barrel-position detection switch board **421** is a board constituting a collapse switch (collapsed-position detection switch) **434***a* and a photographing-position detection switch **434***b* shown in FIG. **35**. The switch board **421** has a lens-barrel stored-position detection pattern **421***a*, a lens-barrel photographing-position detection patterns **421***b*, and a common pattern **421***c*. The contact **420***a* selectively comes into contact with the patterns **421***a* and **421***b*. The common contact **420***b* comes into contact with the common pattern **421***c*. When the lens barrel **403** is in the stored mode, the contact **420***a* comes into contact with the pattern **421***a*. When the lens barrel **403** is in the photographable position, the contact **420***a* comes into contact with the pattern **421***b*. Output signals generated by the contacts are supplied as an output signal of the collapsed-position detection switch **434***a* and an output signal of the photographing-position detection switch **434***b* of the lens barrel to a CPU **432** (FIG. **35**). The switches **434***a* and **434***b* will be described later.

The projecting and retracting operations of the lens barrel interlocked with the opening and closing operations of the barrier in the barrier-attached camera with the above-mentioned structure according to the present embodiment will now be described with reference to FIGS. **26** to **34**.

FIGS. **30** to **34** show sectional views of the barrier and the lens barrel in the respective operating states, the views being taken along the section lines **30**—**30** through **(34)**—**(34)** of FIG. **23**. FIG. **30** shows a state in which the barrier is in the closed position and the lens barrel is retracted in the stored position. FIG. **31** shows a state in which the barrier is in the open position and the lens barrel is in the photographing position. FIG. **32** shows a state in which the barrier is in the semi-open position and the lens barrel is in the photographing position. FIG. **33** shows a state in which the barrier is in the semi-open position and the lens barrel is being retracted to the stored position. FIG. **34** shows a state in which the barrier is in the semi-open position and the lens barrel is retracted in the stored position.

As shown in FIGS. **28** and **30**, when the barrier **402** is in the closed position P2A and the lens barrel **403** is retracted in the collapsed position, the return spring **419** presses the locking shaft **418** in a backward direction, so that the locking shaft **418** comes into contact with the aperture member **422**. In this state, the distal end of the locking shaft **418** is received within the supporting hole **401***i* of the camera body **401**. Accordingly, the barrier **402** is openable.

As shown in FIGS. **26** and **31**, when the barrier **402** is in the open position P2B and the lens barrel **403** is projected to the photographable position, the pressure spring **403***g* presses the locking shaft **418** against the pressing force of the return spring **419**. Thus, the distal end of the locking shaft **418** comes into contact with the inner surface of the barrier **402**.

In the state in which the lens barrel is in the photographing position, when the barrier **402** is slightly slid from the open position P2B in the direction SA, namely, the barrier **402** is moved from the state shown in FIG. **31** to the semi-open position P2C shown in FIG. **32**, the barrier detection switch **401***c* is released from the pressure by the barrier protrusion **402***d*. An OFF signal of the switch **401** is output to the CPU **32** (refer to FIG. **35**). Due to the output, the retracting operation of the lens barrel **403** to the stored position is started.

At this time, the distal end of the locking shaft **418** is fitted into the engagement hole **402***c* of the barrier **402** by the pressing force of the pressure spring **403***g* and the barrier **402** is locked at the semi-open position P2C, so that the barrier **402** cannot further move in the direction SA. Consequently, the distal end face **402***f* (see FIG. **25**) of the barrier **402** never comes into contact with the periphery of the lens barrel **403** located at the photographing position or projected from the camera body **401**, thus protecting the lens barrel **403**. Simultaneously, overload is not applied to the drive motor **411** and the lens barrel is normally retracted.

Following the state shown in FIG. **33**, the lens barrel **403** is retracted to the collapsed position shown in FIG. **34**. For a period during which the lens barrel **403** is being retracted to the collapsed position, the locking shaft **418** is moved to the collapsed position together with the lens barrel **403** in association with the retraction of the pressure spring **403***g* until the lens barrel **403** reaches a predetermined position. However, after the rear end face of the locking shaft **418** comes into contact with the aperture member **422**, the pressure spring **403***g* is moved away from the stopper **418***b* of the locking shaft **418**, thus releasing the interlocking operation. In this state, the lens barrel **403** is already stored in the camera body. The distal end of the locking shaft **418** is stored within the supporting hole **401***i* of the camera body **401**, thus releasing the lock of the barrier **402**.

During the retracting operation of the lens barrel **403** to the collapsed position, if the operating force is continuously applied to the barrier **402** in the direction SA, a frictional holding power is generated in the direction perpendicular to the locking shaft **418** by the engagement hole **402***c* of the barrier **402** and the frictional holding power acts on the distal end of the locking shaft **418** as shown in FIGS. **33** and **34**. Consequently, the distal end of the locking shaft **418** is held in the engagement hole **402***c* of the barrier **402** while being engaged therewith. Thus, the barrier **402** is held as it is

locked. Therefore, there is no adverse effect on the retracting operation of the lens barrel **403** to the collapsed position.

As mentioned above, the operating force applied to the barrier **402** in the closing direction is continuously held and as a result functions as locking-state holding means, due to the mechanism of the contact between the periphery of the distal end of the locking shaft **418** and the inner surface of the engagement hole **402***c* of the barrier **402**. In other words, the locking member moves together with the photographic lens barrel for a period during which the photographic lens barrel is moving to the photographable position. While the photographic lens barrel is moving to the non-photographable position, the interlocking relationship therebetween can be disconnected.

When the lens barrel **403** is retracted in the collapsed position and the operating force applied to the barrier **402** in the direction SA is eliminated, the engagement between the distal end of the locking shaft **418** and the engagement hole **402***c* of the barrier **402** is released as mentioned above, so that the pressing force of the return spring **418** moves the locking shaft **418** to a position where the locking shaft **418** does not project from the camera body **401**. Thus, the barrier **402** can move to the closed position P2A.

In the state in which the lens barrel **403** is in the collapsed position as shown in FIG. **30**, when the barrier **402** is moved in the direction SB up to the open position P2B, the barrier detection switch **401***c* is turned on and an output signal of the switch **401***c* is supplied to the CPU **432**. Thus, projecting the lens barrel **403** to the photographing position is started.

For a period during which the lens barrel **403** is being projected to the photographable position, if the lens barrel **403** is projected beyond a predetermined position, the pressure spring **403***g* of the lens barrel **403** comes into contact with the stopper **418***b* of the locking shaft **418**. After that, the locking shaft **418** is pressed by the pressure spring **403***g* against the pressing force of the return spring **419** and is moved forward together with the lens barrel **403**. As the lens barrel **403** projects from the camera body, the locking shaft **418** is pressed such that the shaft also can project from the camera body. The lens barrel **403** reaches the photographing position and the distal end of the locking shaft **418** comes into contact with the inside of the barrier **402** as shown in FIG. **31**.

In the state in which the lens barrel **403** is in the photographing position as shown in FIG. **31**, when the barrier **402** is moved in the direction SA, the distal end of the locking shaft **418** is fitted into the engagement hole **402***c* of the barrier **402** by the pressing force of the pressure spring **403***g* as mentioned above. Thus, the barrier **402** is locked at the semi-open position P2C. Since the barrier **402** cannot further move in the direction SA, the interference between the barrier **402** and the lens barrel **403** can be avoided. When this state is held, the OFF signal of the barrier detection switch **401***c* is output as mentioned above, thus starting the retraction of the lens barrel **403** to the collapsed position.

The arrangement of a lens-barrel control unit serving as driving control means according to the present embodiment and the primary electric control circuits surrounding the respective detection switches in the camera will now be described using an electric circuit diagram of FIG. **35**.

The camera according to the present embodiment is driven by a battery **431** serving as a power supply. The CPU **432** functions as control means for controlling the entire camera. A motor driver **433** is a part of driving means and is controlled by the CPU **432**. The motor driver **433** drives the drive motor **411** to project or retract the lens barrel **403**.

The CPU **432** receives an output signal of the stored-mode detection switch (collapse switch) **434***a* and an output signal of the photographing-position detection switch **434***b*, thus detecting the projecting or retracting state of the lens barrel **403**, these switches being built in the camera body. The CPU **432** also receives an output signal of the barrier detection switch **401***c* to detect the release of the barrier **402**. In addition, the CPU **432** receives an output signal of the release switch **410***a* which is operated by the release button **410** to start the sequence for photographing.

The control operation of a photographing process including the barrier opening and closing operations will now be described using a flowchart of FIG. **36**. FIG. **34** is a general flowchart of the photographing process including the control operation of the lens barrel **403** upon opening and closing the barrier in the camera according to the present embodiment.

When the barrier **402** is moved from the closed position of the barrier **2** to the open position P2B by a manual operation, the barrier detection switch **401***c* is turned on. In other words, the contact **401***d* comes into contact with the contact **401***e*, thus starting the photographing process of FIG. **36** through the CPU **432**.

In step S**1**, the CPU **432** transmits a driving signal to the motor driver **433**, thus projecting the lens barrel **403**, which is collapsed in the camera, toward the photographing position (photographing standby position) through the drive motor **411**.

In step S**2**, on the basis of the output signal of the photographing-position detection switch **434***b*, the CPU **432** checks whether the lens barrel **403** reaches the photographing position (lens initial position), for example, a zoom wide end position. When it is detected that the lens barrel **403** reaches the photographing position, in step S**3**, the drive motor **411** is turned off to stop the projection of the lens barrel **403**.

After that, the process proceeds to step S**4**. Whether the release button **410** is operated is checked using the release switch **410***a*. When the switch **410***a* is turned on, the process proceeds to step S**5**. The CPU **432** executes the sequence of the photographing process.

In the check in step S**4**, when the turn-off of the release switch **410***a* is detected, the process skips to step S**6**. Whether the barrier detection switch **401***c* of the barrier **402** is turned on or off is checked. When the turn-on of the barrier detection switch **401***c* is detected, namely, when the barrier **402** is moved in the closing direction by the manual operation, the process proceeds to step S**7**. Thus, the lens barrel **403** is driven in the retracting direction.

In step S**8**, on the basis of the output signal of the stored-mode detection switch **434***a*, the CPU **432** checks whether the lens barrel **403** is retracted in the stored (i.e. collapsed) position. When it is determined that the lens barrel **403** reaches the stored position, the process proceeds to step S**9**. Driving the lens barrel **403** is stopped and the present processing routine is finished.

The photo-interrupter **417** in the circuit of FIG. **35** is used for a precise positioning control and the like at the photographing position and the collapsed position of the lens barrel. Since the arrangement is not inevitably required, the detailed description thereof is omitted.

In the above-mentioned barrier-attached camera according to the seventh embodiment, the mechanism for locking the barrier **402** is remarkably simple and the number of components is small. While the lens barrel **403** is being retracted to the collapsed position, even if the barrier **402** is pressed in the closing direction, the locking shaft **418** is

fitted into the engagement hole **402***c* of the barrier **402** to lock the barrier at the barrier semi-open position P2C. Thus, interference with the lens barrel **403** is positively prevented.

During the retracting operation of the lens barrel, if the pressing force is not applied to the barrier **402**, the return spring **419** returns the locking shaft **418** as it is to an unlocking position, namely, a position where the locking shaft **418** is not projected from the supporting hole **401***i* of the camera body **401**. However, when the locking shaft **418** is held to be pressed in the direction SA by the barrier **402**, the locking shaft **418** is not retracted and the pressure spring **403***g* is retracted together with the lens barrel **403**. Therefore, the driving system of the lens barrel **403** is driven in the normal retracting state without overload.

As mentioned above, according to the seventh embodiment, in the camera having the barrier which is movable between the open position where the photographic lens is exposed and the closed position where the photographic lens is covered, even if the barrier is pressed in the closing direction during the retracting operation of the lens barrel to the stored position, the barrier is locked. Accordingly, the barrier never comes into contact with the lens barrel and overload is not applied to the lens-barrel driving means. The structure of the mechanism for locking the barrier is remarkably simple, thus resulting in a reduction in the cost.

What is claimed is:

1. A camera comprising:

a photographic lens barrel movable along a lens movement path between a photographable position and a non-photographable position;

a barrier movable along a barrier movement path between a closed position where the barrier covers the photographic lens barrel and an open position where the barrier is withdrawn from a front surface of the photographic lens barrel, the barrier movement path intersecting the lens movement path;

a locking member being supported so as to be movable along an optical axis of the photographic lens barrel between an engaging position where it is possible to engage the barrier when the barrier moves to the closed position and a withdrawn position where it is displaced from the barrier;

a pressing member for pressing the locking member towards the withdrawn position and;

a locking member movement restricting means for restricting movement of the locking member responsive to movement of the photographic lens barrel, enabling the locking member to move against the pressing force of the pressing member to the engaging position to engage the barrier when the photographic lens barrel is at the photographable position, and enabling the locking member to be withdrawn by the pressing force of the pressing member to the withdrawn position and disengaged from the barrier when the photographic lens barrel is at the non-photographable position;

wherein the locking member engages the barrier, and prevents movement of the barrier from an attempt to move the barrier from the open position to the closed position when the photographic lens barrel is located in the barrier movement path of the barrier, and furthermore, engagement of the locking member with the barrier is maintained so that an operation force applied to the barrier in the closing direction does not affect the movement of the photographic lens barrel if the operation force is continuously applied even in a state in which the photographic lens barrel is displaced from the barrier movement path of the barrier.

2. The camera according to claim **1**,

wherein the locking member is a stick-like member which is arranged to move along a path substantially parallel to said optical axis.

3. A camera according to claim **1** further comprising:

said barrier having an opening substantially conforming to a shape of an end of the locking member engaging the barrier for encircling said engaging end.

4. A camera according to claim **1**, further comprising:

a stopper fixed on said locking member, said pressing member engaging one side of said stopper, and said locking member movement restricting means selectively engaging an opposite side of said stopper.

5. A camera according to claim **1**, further comprising:

said locking member movement restricting means being fixed to said photographic lens barrel.

6. A camera comprising:

a photographic lens barrel movable alone a lens movement path between a photographable position and a non-photographable position;

a barrier movable alone a barrier movement path between a closed position where the barrier covers the photographic lens barrel and an open position where the barrier is withdrawn from a front surface of the photographic lens barrel, the barrier movement path intersecting the lens movement path:

a locking member being supported so as to be movable alone an optical axis of the photographic lens barrel between an engaging position where it is possible to engage the barrier when the barrier moves to the closed position and a withdrawn position where it is displaced from the barrier;

a pressing member for pressing the locking member towards the withdrawn position and;

a locking member movement restricting means for restricting movement of the locking member responsive to movement of the photographic lens barrel, enabling the locking member to move against the pressing force of the pressing member to the engaging position to engage the barrier when the photographic lens barrel is at the photographable position, and enabling the locking member to be withdrawn by the pressing force of the pressing member to the withdrawn position and disengaged from the barrier when the photographic lens barrel is at the non-photographable position;

wherein the locking member engages the barrier, and prevents movement of the barrier from an attempt to move the barrier from the open position to the closed position when the photographic lens barrel is located in the barrier movement path of the barrier, and furthermore, engagement of the locking member with the barrier is maintained so that an operation force applied to the barrier in the closing direction does not affect the movement of the photographic lens barrel if the operation force is continuously applied even in a state in which the photographic lens barrel is displaced from the barrier movement path of the barrier;

wherein, when the photographic lens barrel reaches a first given position when moving to the photographable position, the locking member interlockingly moves with the photographic lens barrel, and when the photographic lens barrel reaches a second given position when moving to the non-photographable position, the

locking member moves away from an interlocking relation with the photographic lens barrel.

7. A camera comprising:

a photographic lens barrel having a lens movement path of a photographic lens which is driven by a drive source to move along an optical axis between a photographable position and a non-photographable position;

a barrier movable along a barrier movement path and which is manually movable along said path between a closed position where the barrier covers the photographic lens barrel and an open position where the barrier is withdrawn from a front surface of the photographic lens barrel, the barrier movement path intersecting the lens movement path;

a locking member which is guided along a locking member path substantially parallel to said optical axis and movable between a projected position wherein one end thereof is in contact with the barrier and a withdrawn position wherein said one end is withdrawn from the barrier;

a first pressing member applying a force to the locking member to move the locking member towards the withdrawn position;

a stopper portion provided on the barrier for stopping the movement in the closing direction of the barrier by engaging with said locking member one end projected at the projected position at a predetermined moved position of the barrier movement path; and

a second pressing member provided on the photographic lens barrel, which engages the locking member and moves the locking member against the force of the first pressing member and towards the projected position as the photographic lens barrel moves from the non-photographable position to the photographable position;

whereby, in a state in which the photographic lens barrel is moved to the photographable position, if an attempt is made to move the barrier from the open position to the closed position, the locking member which is moved to the projected position by the second pressing member engages the stopper portion of the barrier so that further movement of the barrier towards the closed position is stopped at a predetermined semi-open position, and in a state in which the photographic lens barrel is moved to the non-photographable position, and the second pressing member is displaced from the locking member, the locking member is moved toward the withdrawn position by the first pressing member.

8. The camera according to claim **7**,

wherein when the photographic lens barrel is in the barrier movement path of the barrier, if a force is applied to the barrier in an attempt to move the barrier from the open position to the closed position, the engagement of locking member with the barrier inhibits movement of the barrier, and this engagement is maintained whereby an operation force applied to the barrier in the closing direction does not affect movement of the photographic lens barrel if the operation force is continuously applied even in a state in which the photographic lens barrel is displaced from the barrier movement path of the barrier.

9. The camera according to claim **7**,

wherein the second pressing member has an elastic pressing characteristic which provides a pressing force to move the locking member against the pressing force of the first pressing member and towards the projected position in a state in which the second pressing member is in contact with the locking member.

10. The camera according to claim **9**,

wherein the locking member pressed by the second pressing member is in contact with an inner side of the barrier in a state in which the photographic lens barrel is moved to the photographable position.

11. The camera according to claim **7**,

wherein the locking member is a shaft-like member.

12. The camera according to claim **7**,

wherein the locking member starts interlockingly moving to the projected position when engaged by the second pressing member as the photographic lens barrel moves from the non-photographable position to the photographable position, and if the photographic lens barrel starts moving from the photographable position to the non-photographable position, the locking member is movable to the withdrawn position by the first pressing member.

13. The camera according to claim **7**, further comprising:

a lens barrel drive control means in which, if the barrier is moved from the closed position towards the open position and it is detected by a detector that the barrier has reached a vicinity of the open position, the photographic lens barrel is driven by the drive source from the non-photographable position to the photographable position responsive to a first detector condition, and if the barrier is moved from the open position towards the closed position and it is detected by the detector that the barrier has moved from the vicinity of the open position, the photographic lens barrel is driven by the drive source from the photographable position to the non-photographable position responsive to a second detector condition.

14. The camera according to claim **7**,

wherein said barrier has an opening which is aligned with the locking member path when in a given semi-open position whereby an end of the locking member enters said opening when the locking member is in the projected position under a pressing force of said second pressing member.

15. The camera according to claim **14** wherein the opening in said barrier is along an inner surface of said barrier and has a depth which is less than a thickness of the barrier in a region of said opening.

16. A camera comprising:

a photographic lens barrel movable along a lens movement path between a photographable position and a non-photographable position;

a barrier movable along a barrier movement path between a closed position where the barrier covers the photographic lens barrel and an open position where the barrier is withdrawn from a front surface of the photographic lens barrel, the barrier movement path intersecting the lens movement path;

a locking member being supported so as to be movable along an optical axis of the photographic lens barrel between an engaging position where it is possible to engage the barrier when the barrier moves toward the closed position and a withdrawn position where it is displaced from the barrier;

a pressing member for pressing the locking member towards the withdrawn position and;

a locking member movement restricting element for restricting movement of the locking member responsive to movement of the photographic lens barrel, enabling the locking member to move against a press-

ing force of the pressing member to the engaging position to engage the barrier when the photographic lens barrel is at the photographable position, and enabling the locking member to be withdrawn by the pressing force of the pressing member to the withdrawn position and disengaged from the barrier when the photographic lens barrel is at the non-photographable position;

wherein the locking member engages the barrier, and prevents movement of the barrier from an attempt to move the barrier from the open position to the closed position when the photographic lens barrel is located in the barrier movement path of the barrier, and furthermore, engagement of the barrier by the locking member is maintained so that an operation force applied to the barrier in the closing direction does not affect the movement of the photographic lens barrel if the operation force is continuously applied even in a state in which the photographic lens barrel is displaced from the barrier movement path of the barrier.

17. The camera according to claim **16**,

wherein the locking member is a stick-like member which is arranged to move along a path substantially parallel to said optical axis.

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